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SYMPOSIUM ON TRICHOMONIASIS—PART I

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THE RECURRENCE OF *Trichomonas vaginalis* VAGINITIS — *William Fuller*

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THE FIRST INTERNATIONAL SYMPOSIUM ON HEALTH AND TRAVEL

PART III

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Conrad Berens, M.D.
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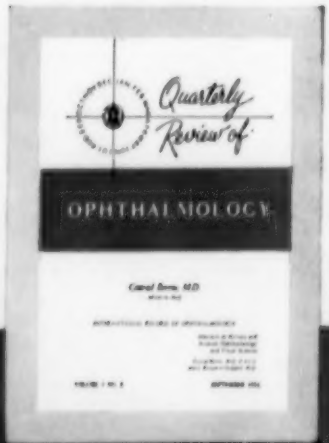

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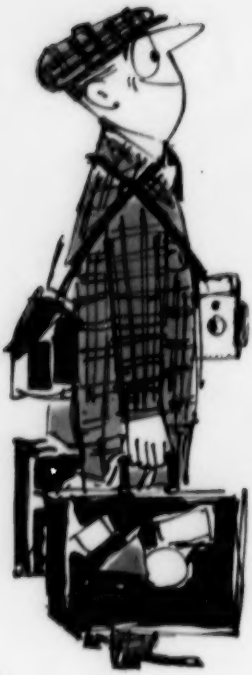

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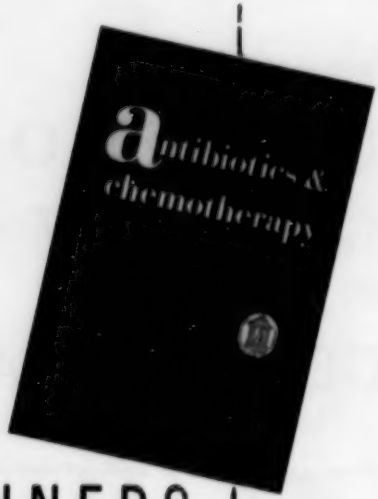

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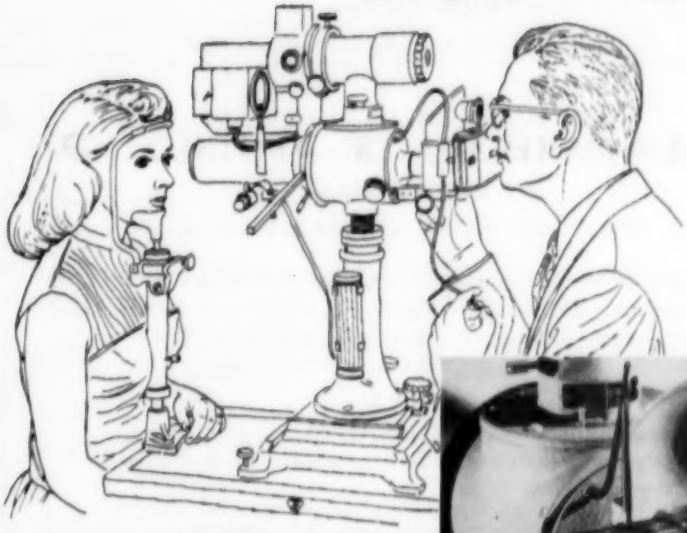

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THIRD ANNUAL SYMPOSIUM ON ANTIBIOTICS

The Third Annual Symposium on Antibiotics, sponsored by the Food and Drug Administration, Division of Antibiotics, U. S. Department of Health, Education, and Welfare, in collaboration with the journals, ANTIBIOTICS & CHEMOTHERAPY and ANTIBIOTIC MEDICINE, will be held on November 2, 3, and 4, 1955, in Washington, D. C.

Doctor Henry Welch, Director of the Division of Antibiotics and Editor of ANTIBIOTICS & CHEMOTHERAPY and ANTIBIOTIC MEDICINE, will act as Chairman of the Symposium.

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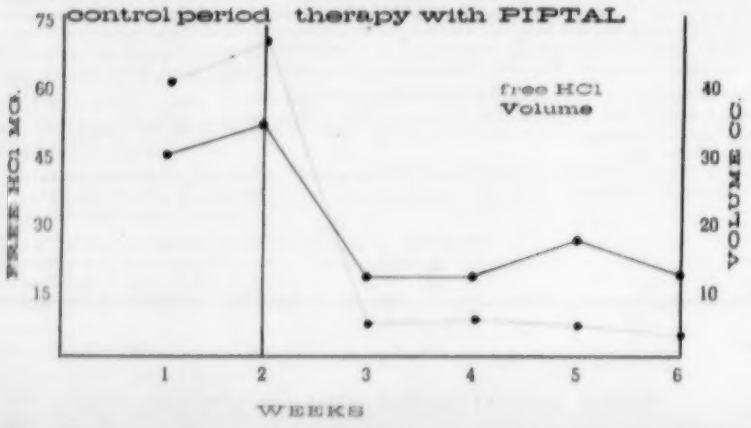

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SYMPOSIUM ON TRICHOMONIASIS—PART I

Guest Editor—HERBERT S. KUPPERMAN, M.D., Ph.D.

Vaginal Cytology in *Trichomonas* Infestation

George N. Papanicolaou, M.D., and Wanda H. Wolinska†*

NEW YORK, N. Y.

Trichomonas vaginalis was first described by A. Donne in 1837. He observed the parasite in the vaginal discharge and described it as a small mobile organism, the size and shape of a pus cell. Since then, its morphology, physiology, and pathogenicity have been the subject of numerous investigations.

In smears prepared from vaginal secretion, trichomonads appear as pearlike or round organisms, the size of which varies greatly. Some have been reported to be as small as 6μ, others as large as 30μ in diameter.

Its detection in vivo is relatively simple due to its great motility. The parasite rotates on its axis by means of its undulating membrane, while the movement of the flagella brings about a jerky sort of progression.

The shape of the parasite changes frequently with its movement, and pseudopodia-like projections may be observed. In the stage of inactivity the organism assumes a more or less spherical shape.

Its presence in fixed wet or dry smears can be demonstrated by various tinctorial methods. The staining of the flagella and its undulating membrane can be achieved only by specific stains such as Bodian's technique, Romanowsky's stain or others. However, these techniques are cumbersome for use in routine examination.

With the staining procedures routinely employed for the study of vaginal smears, such as the Papanicolaou stain, the flagella and the undulating membrane of the parasite are rarely visible, and the identification of the organism is chiefly based on

* Papanicolaou Research Laboratory, Department of Anatomy, Cornell University Medical College, New York, New York.

† Strang Laboratory of Cytology, Memorial Center, New York, New York.

FIG. 1. *Trichomonas vaginalis.* (OG6, EA36 stains. × 1200.)

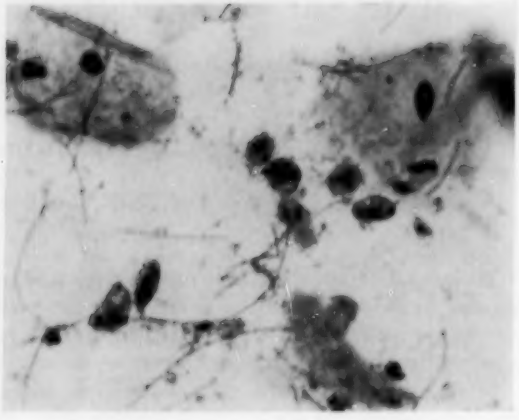

FIG. 2. *Trichomonas vaginalis.* (OG6, EA36 stains. × 600.)

its characteristic form, the typical small elliptic nucleus and the occasional presence of cytoplasmic granules. Trichomonads usually appear in smears singly though aggregates may also be occasionally seen.

The changes produced by Trichomonas in the cytology of the vagina have been studied extensively in recent years especially since the routine examination of vaginal smears found a wide application in the study of problems related to sterility, the evaluation of hormonal action, the diagnosis of endocrine dysfunctions, and various pathologic conditions, including cancer.

In cases of Trichomonas infestation, vaginal smears exhibit, as a rule, a characteristic pattern. There is a marked increase in the number of the cornified cells of the superficial squamous type. Some of the cells have irregular outlines and are covered with smudges of grayish mucus. The cytoplasm is often dense and intensely acidophilic. The nuclei are deeply stained in well-preserved cells, while in degenerating cells they are faintly stained and have a pinkish appearance. A distinctive and rather frequently observed feature is the presence of a perinuclear halo. Marked keratinization of the cells is occasionally noted.

The parabasal cells are often prominent and appear singly or in small clusters.

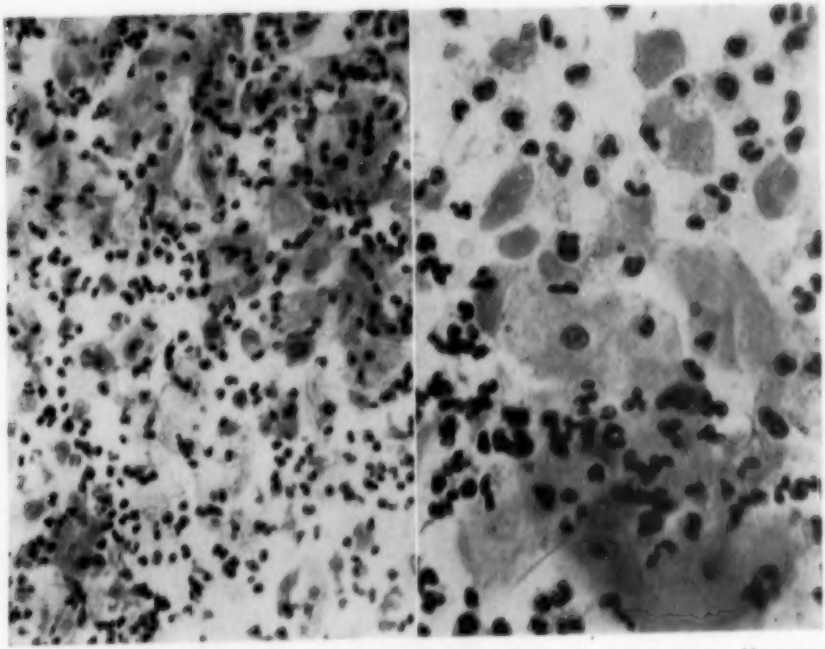

FIG. 3A (left) and FIG. 3B (right). Characteristic pattern of *Trichomonas*-positive smears. Note great variation in size of the parasites. (OG6, EA36 stains. FIG. 3A ×300. FIG. 3B ×600.)

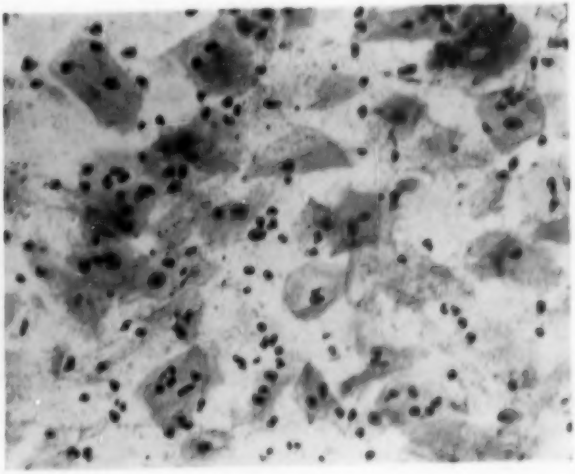

FIG. 4. Cornified superficial cells with deeply stained nuclei and degenerating squamous cells. Note large amount of mucus. (OG6, EA36 stains. ×300.)

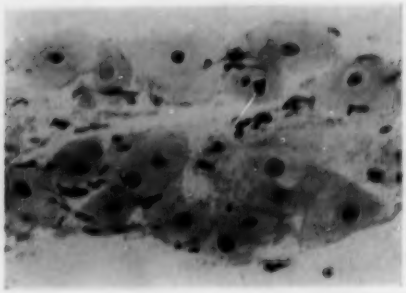

FIG. 5. Superficial squamous cells showing perinuclear halo. (OG6, EA36 stains. ×300.)

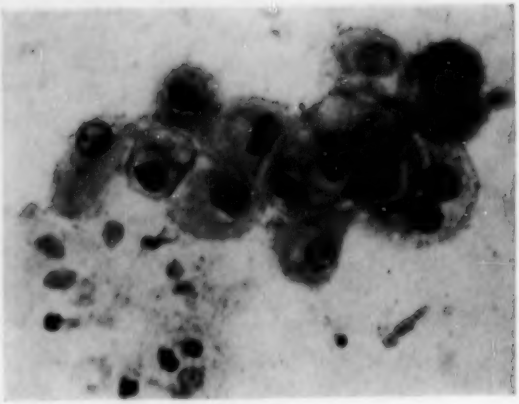

FIG. 6. Parabasal cells showing vacuolation of the cytoplasm and variation in size of the nuclei. (OG6, EA36 stains. ×600.)

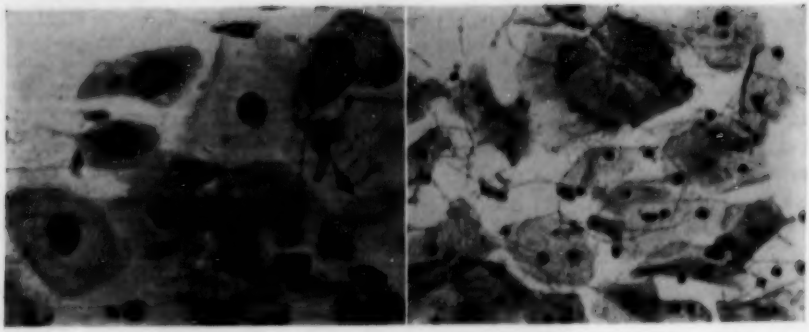

FIG. 7 (left). Superficial and parabasal cells with markedly enlarged hyperchromatic nuclei. (OG6, EA36 stains. ×600.)

FIG. 8 (right). Long bacilli in a *Trichomonas*-positive smear. (OG6, EA36 stains. ×300.)

They show some variation in size, and a more pronounced vacuolation of the cytoplasm than that seen in normal cells. An increased affinity to acidophilic stains is sometimes noticeable. All these changes may in some cases be the result of concomitant secondary inflammatory conditions.

In a number of Trichomonas-positive smears the exfoliated cells may exhibit marked nuclear atypia. This consists chiefly in an enlargement, irregularity in form, and hyperchromasia of the nuclei. These changes, when pronounced, may lead to a false interpretation of the cells as malignant. It is thus important to explore thoroughly every vaginal and cervical smear showing nuclear atypia to rule out the presence of Trichomonas. This does not imply that every smear with abnormal nuclear forms in which trichomonads have been found should be considered as negative for malignancy. On the other hand, more conclusive evidence should be sought before such a smear is reported as definitely positive. Nuclear atypia in association with Trichomonas may be observed not only in the superficial, intermediate, and parabasal squamous cells, but also in cells of endocervical origin.

Extreme cytologic aberrations are seen in a relatively small number of Trichomonas infestations. In most instances the smears show only minor morphologic changes and in many cases there may be a complete absence of clinical symptoms.

Trichomonas infestation is usually associated with a high *p*H, and a rich bacterial growth of cocci. A bacillary flora is more prevalent in fungal infections. The coexistence of Trichomonas and *Monilia albicans* is a rather rare occurrence. In some cases of Trichomonas-positive smears, long bacilli are present, giving the smear a characteristic appearance which is often helpful in the detection of the parasites.

The technical procedure upon which the above descriptions are based is the one developed by Papanicolaou for the routine examination of vaginal secretion. Fixation of the smears with alcohol-ether provides good preservation of the parasites. Their identification and the study of their morphologic characteristics are by far more satisfactory in wet fixed than in dry preparations. The OG-EA stain gives a good coloration of the cytoplasm and the nucleus of the parasites. As already stated, the demonstration of the small elliptic nucleus of this organism is a very good diagnostic criterion.

The relative accuracy of the Papanicolaou smear and the hanging-drop technique is now under special study at the Strang Laboratory of Cytology. In 200 cases determined as positive by the hanging-drop technique, cytologic smears screened routinely, without previous knowledge of results by the hanging-drop, were reported as positive for Trichomonas in 163 cases (81 per cent). A review of the remaining 37 cases established the presence of Trichomonas in another 33, thus raising the number of positive cases to 196 or 98 per cent. On the other hand, in a fair number of smears in which the routine hanging-drop method was negative, the presence of Trichomonas was proven by cytologic examination. One may thus conclude that a failure to detect the presence of Trichomonas may occur with either method. A higher degree of accuracy may, of course, be expected by the combination of the two methods.

BIBLIOGRAPHY

1. Bechtold, E., and Reicher, N. B.: The relationship of *Trichomonas* infestation to false diagnosis of squamous carcinoma of the cervix, Cancer 5:(May) 1952.
2. Bernstine, J. B., and Rakoff, A. E.: Vaginal infections, infestations and discharges. New York, 1953.
3. Caglian: Microscopic diagnosis of trichomonas vaginalis. Akuszerstwo i Ginekologie 1954.
4. Craig, C. F., and Faust, E. C.: Clinical parasitology, pp. 126–129, 1945.
5. Donne, A.: Nouvelle expérience sur les animalcules spermatiques et sur quelques-unes des causes de la stérilité chez la femme. Paris, 1844.
6. Kean, B. H., and Day, E.: Trichomonas vaginalis infection. An evaluation of three diagnostic techniques with data on evidence, Am. J. Obst. & Gynec. *68*:(Dec.) 1954.
7. Kupferberg, A. B.: The morphology of trichomonas vaginalis in bacteria free cultures. Manuscript State University of Iowa, Iowa City, Iowa, June, 1941.
8. Papanicolaou, G. N.: A new procedure for staining vaginal smears, Science *95*:April 24, 1942.
9. Papanicolaou, G. N.: Atlas of exfoliative cytology, Commonwealth, 1954.
10. Trussell, R. E.: Trichomonas vaginalis and trichomonasis, Springfield, Ill., 1947.
11. Thompson, L. R.: Wet suspension staining method for rapid examination of exfoliated cells and parasites from vagina and intestine, Am. J. Surg. Vol. *86*, No. 1, 1953.

The Recurrence of *Trichomonas vaginalis* Vaginitis

William Filler, M.D.

DEPARTMENT OF OBSTETRICS AND GYNECOLOGY, NEW YORK UNIVERSITY
BELLEVUE MEDICAL CENTER, NEW YORK, N. Y.

There seems to be little difficulty in alleviating the symptoms of the acute form of *Trichomonas vaginalis* vaginitis or in producing a trichomonal-free vaginal smear. The protozoa are highly labile and quickly destroyed by any one of literally hundreds[1] of recommended trichomonacidal agents. In fact, the great efficacy of so many different chemicals makes one feel the solution to the problem of a permanent cure for *T. vaginalis* vaginitis is not in finding a more potent agent, but rather in preventing the parasite's reappearance.

It would appear that the frequency with which *T. vaginalis* vaginitis recurs is due either to inadequacy of treatment, to reinfection, or possibly to both. It is these aspects in the care of *T. vaginalis* vaginitis which require amplification.

INADEQUACY OF TREATMENT

The *T. vaginalis* thrives in moisture but dies almost immediately in a dessicated[2] environment. A thorough scrubbing of all the vaginal walls, a drying of them, followed by painting[3] of the surfaces with a trichomonacidal agent, and insufflating with a trichomonacidal powder should be the first steps in treatment. Repeating the process at weekly intervals and, in the interim, maintaining this atmosphere by the nightly insertion of trichomonacidal suppositories will rid most vaginas of trichomonads at the end of four to six weeks, provided that all sources of reinfection have also been eliminated. Any less rigorous form of treatment would constitute inadequate therapy, since it requires only a few viable trichomonads lurking in the rugae of the vaginal walls to precipitate an acute exacerbation of the disease. Despite the lability of the organism, it is understandable that treatment gauged only to symptom response may be too short and not sufficiently sustained to free the vagina completely of trichomonads.

It might be stated here that there has been no substantiation[4] of the theory that there are encysted forms of trichomonads which are resistant to trichomonacides, and that these are responsible for the recurrence of the vaginitis.

It has been frequently stated that the flagellate (*T. vaginalis*)[5] acts symbiotically with other bacterial[6] or fungal organisms to produce vaginitis. To date, however, no single bacterial or fungal organism has been found associated with the trichomonads in clinical cases of vaginitis which do not appear in the normal vagina. Antibiotics have been singularly unsuccessful in producing a less frequent recurrence.

Many investigators insist that a restoration of the vaginal flora to its normal *p*H is[7] essential before a permanent cure may be obtained. However, *T. vaginalis* has

been shown to survive and flourish in an environment with a *p*H ranging from 3.6 to 4.7.[8]

Although the chemotherapeutic approach in the treatment of *T. vaginalis* has resulted in a high percentage of success, the persistence of an irreducible, otherwise unaccountable, number of failures makes one ponder on the possible validity of the theory that this chronic form of *T. vaginalis* is an emotionally conditioned disease. Moore and Simpson[9] state that, as a result of psychobiologic stress, undetermined physiologic alterations occur in the vagina predisposing it to the development of symptomatic trichomonal vaginitis. Therefore, adequate therapy in the chronic recurrent form would call for a psychologic approach in keeping with the concept that the disease may be psychosomatic in nature.

REINFECTION

An intensive search for possible sources of reinfection should be made in all cases of *T. vaginalis* that have recurred after adequate therapy.

These sources may be classified as endogenous or exogenous.

Endogenous. Cervix. Although the cervix[10, 11] rarely harbors *T. vaginalis*, the presence of an extensive cervical erosion calls for adequate electrocauterization.

Bartholin's and Skene's Glands.[12, 13] These have both been reported as having *T. vaginalis* involvement. The possibility that these glands may be avenues of reinfection should always be considered.

Rectal.[14] Although *Trichomonas hominis*, the normal inhabitant of the rectum, is not pathogenic in the vagina,[14, 15] the temporary residence of *T. vaginalis* in the lower rectum must always be considered. Should they be found in chronic, recurrent cases, nightly insertion of rectal trichomonacidal suppositories is essential to adequate therapy.

Bladder. Here, too, in chronic recurrent cases, careful investigation of the lower urinary tract will disclose[16] frequent involvement. Thorough elimination of the parasite from the urethera and bladder is essential in the treatment of these intractable cases.

Exogenous. Despite the fact that *T. vaginalis* vaginitis has always been referred to as a nonvenereal disease, the frequency of reinfection following coitus calls for a thorough examination[17] of the husband in all chronic, recurrent cases. Although examination of the urine or prostatic secretion may not reveal the flagellate, it is often found in the smegma under the preputial sac.

Coitus is always interdicted during treatment. When it is resumed, the husband should be impressed with the necessity of local hygienic care. The penis should be washed thoroughly before and after coitus, and a condom should be worn during the act.

It is known that trichomonads[7] in droplets of vaginal discharge deposited under natural conditions may survive sufficiently long to permit transfer to another individual where they may again be established. It is conceivable therefore that transmission by inanimate objects such as douche nozzles, toilet seats, towels, physicians'

gloves, and instruments may occur. Much less likely in this category are unclean bathtub water and contaminated pools.

The answer to this source of reinfection, of course, is thorough and consistent hygienic care.

SUMMARY

The gynecologist will reduce the number of recurrent cases of *Trichomonas vaginalis* vaginitis to a minimum by:

1. Thorough, adequate treatment which will include, if necessary, an inquiry into possible psychogenic factors contributing to recurrence.
2. Careful elimination of all possible sources of reinfection.

BIBLIOGRAPHY

1. Trussel, R. E.: Trichomonas Vaginalis and Trichomoniasis, Springfield, Ill., Charles C Thomas, 1947, 149–218.
2. Kessel, J. K., and Thompson, C. F.: Proc. Soc. Exper. Biol. & Med. *74*:755–758, Aug. 1950.
3. Filler, W.; Drezner, N., and Adamo, F. H.: Am. J. Obst. & Gynec. *43*:1057–1058, 1942.
4. Trussel, R. E.: Trichomonas Vaginalis and Trichomoniasis, Springfield, Ill., Charles C Thomas, 22, 1947.
5. Hibbert, G. F., and Falls, F. H.: Am. J. Obst. & Gynec. *36*:219–229, 1938.
6. Lash: Am. J. Obst. & Gynec. *67*:138–142, Jan., 1954.
7. Trussel, R. E.: Trichomonas Vaginalis and Trichomoniasis, Springfield, Ill., Charles C Thomas, 1947, p. 166.
8. Feo, L. G.: Am. J. Obst. & Gynec. *65*:1330–1333, June, 1953.
9. Moore, and Simpson,.: Am. J. Obst. Gynec. 974-979 Oct. 1954.
10. Pattyson, R. A.: N. Y. State J. Med. *37*:41–51, 1937.
11. Siston, W. G., and Siston, W. A.: J. Obst. & Gynec. Brit. Emp. *46*:474–502, 1939.
12. Gurner, W. S.: Am. J. Surg. *33*:500–508, 1936.
13. Shelanski, H. A., and Santz, S. P.: Am. J. Obst. & Gynec. *37*:294–297, 1939.
14. Peterson, P.: Am. J. Obst. & Gynec. *35*:1004–1009, 1938.
15. Morton, J. H.: Brit. J. Ven. Dis. *19*:121–125, 1943.
16. Karnaky, K. J.: Texas State J. Med. *29*:662–663, 1934.
17. Lancelry, F.: Brit. J. Ven. Dis. *29*:213–217, 1953.

Tyrothricin in the Treatment of Vaginitis Due to *Trichomonas vaginalis*

William E. Barfield, M.D.

THE MEDICAL COLLEGE OF GEORGIA, AUGUSTA, GA.

The effectiveness of various antibiotics in the treatment of vaginitis due to *Trichomonas vaginalis* has been established through laboratory studies[1] and clinical evaluation.[2] Encouraging results with streptomycin, chlortetracycline, and other antibiotics were reported in early 1949.[3] In vitro studies and clinical evaluation of various chemical agents and antibiotics, as they have become available, have been constantly pursued at this clinic.[3-7] Among the antibiotics studied in vitro, tyrothricin proved to be the most effective trichomonacidal agent.[1] However, on earlier clinical trial (1950) it appeared to be too irritating to the vaginal mucosa to be of clinical value. Since that time, removal of impurities and improvement in methods of production of tyrothricin eliminated this irritating effect, and clinical evaluation as a trichomonacidal agent seemed warranted.

MATERIAL AND METHODS

Most of the patients used in this study presented themselves for treatment of vulvovaginitis with profuse vaginal discharge and itching or burning of the vulva. A few patients were asymptomatic except for leukorrhea. In all patients the diagnosis was established as follows. A sterile cotton applicator was placed into the vagina before the use of any lubricant and immediately placed into 1 cc. of sterile saline. A drop of this suspension of vaginal secretions was immediately placed on a clean glass slide and examined under the microscope. The presence of motile trichomonads was regarded as essential for diagnosis.* No patients with nonspecific vaginitis or vaginitis due to monilia were included in this group. Patients with combined infections, such as *Monilia albicans* and *Trichomonas*, were also excluded, although in many such instances the *Trichomonas* responded favorably to treatment.

The medication was administered in the form of uncoated, compressed tablets containing 5 to 10 mg. tyrothricin, for vaginal insertion.*

Patients were advised to insert the tablet as far into the posterior fornix of the vagina as possible after taking a thorough cleansing douche with 4 tablespoons of vinegar in 2 quarts of warm water. This procedure was recommended twice daily for 12 days, then once daily at bedtime, to be continued throughout the next menstrual period, and for one week after the period. Abstinence from intercourse was

* Colpotab containing tyrothricin (5 mg.), chlorophyll, beta-lactose, phenylmercuric acetate, sodium lauryl sulfate, and excipients, buffered to an acid *p*H, was supplied by the Purdue Frederick Co., New York, N. Y.

advised during the treatment period. After this initial course of therapy patients were asked to return within one week, and to use neither medication nor douche for two days before examination. If motile trichomonads were present in the saline suspension of vaginal secretions at this time, this was regarded as a "treatment failure." If no trichomonads were detected upon careful microscopic examination of the vaginal secretions, patients were advised to repeat the treatment once daily through the next three menstrual periods, beginning one week before the period, continuing during the period, and for one week thereafter. Criteria for cure at the end of this time were complete relief of symptoms and absence of trichomonads. This regimen of therapy was found to be the most satisfactory of several methods tried, and the continuation of treatment throughout three cycles was chosen because the majority of recurrences appeared during or shortly after a menstrual period. Regardless of the effectiveness of a therapeutic agent, it can offer no assurance against reinfection in a susceptible individual. Although efforts were made to reveal hidden sources of reinfection (such as Bartholin or Skene gland infection, and infestation of the urinary bladder or marital partner) initial relief of symptoms and disappearance of the organisms were not delayed by these factors.

TABLE I

Tyrothricin in Treatment of Trichomonas vaginalis *vaginitis*

	No.	%
Patients treated	70	
Not available for follow-up evaluation	18	
Patients with adequate follow-up examinations	52	
Patients cured (symptomatic and microscopic)	37	71.2
Temporary benefit, but not cured	7	13.4
Failure	8	15.4

RESULTS

There were no untoward effects of therapy noted in this series. No patient complained of vaginal irritation or sensitivity to the medication. Although yeastlike organisms were found in the vaginal secretions of 4 patients during the follow-up examinations, these patients had no symptoms, and no cases of vulvovaginitis caused by *Monilia* were encountered as a complication of therapy with tyrothricin.

Seventy patients with vaginitis or vulvovaginitis due to *Trichomonas* were treated according to the outlined plan of therapy; 52 of these were available for adequate follow-up examinations. The 18 patients who did not complete the course of therapy as outlined or did not return for recheck are not included in the series. Forty-four of the 52 patients (84 per cent) adequately studied were benefited by therapy, and 37 (71.2 per cent) of these were considered cured. The other 7 patients (13.4 per cent) were entirely relieved of symptoms but were not considered cured because of the presence of one or more motile trichomonads in the vaginal secretions after the initial course of therapy or during the intervals between the periods of follow-up

therapy. There was therapeutic failure in 8 patients (15.4 per cent), according to our criteria for cure, although 4 of these reported relief of symptoms. In 4 of these failures trichomonads were found in the presence of the medication which had been placed in the vagina the night before.

SUMMARY AND CONCLUSIONS

1. In vitro studies of various antibiotics revealed that chlortetracycline, oxytetracycline, tyrothricin, and streptomycin were effective trichomonacidal agents. Although tyrothricin was the most effective trichomonacidal agent in vitro, it proved too irritating at the time of previous attempts at clinical use. Improved production methods and removal of impurities have eliminated the irritating qualities of tyrothricin, and a clinical evaluation of its effectiveness in the treatment of vaginitis due to *Trichomonas vaginalis* is reported.

2. An outline of treatment is presented which is directed toward rapid elimination of the organism, and prevention of early recurrence of the infection for a sufficient time to allow increased vaginal resistance to the infection.

3. Of the 70 patients treated (with Colpotab), 52 were available for adequate follow-up evaluation. Criteria for cure included both relief of symptoms and eradication of the trichomonads. Forty-four patients (84 per cent) received definite benefit from therapy and of these, 37 (71.2 per cent) were cured. Eight of the 52 patients adequately followed were considered treatment failures (15.4 per cent).

4. There were no untoward effects of therapy. The results of this study indicate that tyrothricin is just as effective a trichomonacidal agent in 5 to 10 mg. dosage as are the other antibiotics studied, in much larger doses.

5. According to the criteria used for evaluation of cure, it is believed that this represents a maximum cure rate for vaginal trichomoniasis, since regardless of the effectiveness of a therapeutic agent, it can offer no assurance against recurrence or reinfection in a susceptible individual. There appears to be no contraindication to sustained therapy for a reasonable period of time, or to repeated courses of therapy at intervals.

BIBLIOGRAPHY

1. Greenblatt, R. B., and West, R. M.: In vitro studies on the trichomonacidal effect of certain drugs and antibiotics, Urol. & Cutan. Rev. *54*:72–77, 1950.
2. Greenblatt, R. B., and Barfield, W. E.: Aureomycin in the therapy of trichomonas vaginalis vaginitis, Am. J. Obst. & Gynec. *62*:423–426, August 1951.
3. Greenblatt, R. B., and West, R. M.: Antibiotics in treatment of trichomonas vaginalis, J.M.A. Georgia *38*:350, 1949.
4. Greenblatt, R. B.: Urol. & Cutan. Rev. *54*:72, 1950.
5. McCall, E. F., and Greenblatt, R. B.: The diagnosis and therapeusis of vulvovaginitis, Urol. & Cutan. Rev. *45*:418, 1944.
6. Greenblatt, R. B.: Sulfonamide insufflations in the therapy of trichomonas vaginalis vaginitis, J.M.A. Georgia *31*:172, 1942.
7. Greenblatt, R. B.: Trichomoniasis, West. J. Surg. *53*:135, 1945.

Trichomoniasis in the Male

John W. Draper, M.D.

SURGEON-IN-CHARGE, SECOND UROLOGICAL DIVISION (CORNELL) BELLEVUE HOSPITAL
NEW YORK, N. Y.

Infestation of the male genitourinary tract with trichomonads may be completely asymptomatic or may produce all of the signs and symptoms of acute or chronic urethritis or prostatitis. It is often extremely difficult to demonstrate trichomonads in the male; this probably explains why there is such a variation in the incidence reported by different observers. Feo[1] found *Trichomonas vaginalis* in 28.7 per cent of 246 men who were classified as having nonspecific urethritis. It is interesting that he notes this entire group of men were relatively free from symptoms. Lehrman[2] found *T. vaginalis* in 1 per cent of 500 nongonorrheal urethritis cases. It has become apparent from our own experience that trichomonads are present more often than we have suspected in the past and evidence of them can be found in from 5 to 15 per cent of the male population of a urologist's clinic or private practice. The parasites may be found in the anterior urethra, the posterior urethra, the prostate, less commonly in the bladder, and very rarely in the upper urinary tract.

DIAGNOSIS

The presence of trichomonads in the male genitourinary tract should always be suspected in the husband of a woman who is repeatedly reinfected. Unless the infestation is very heavy, it is often extremely difficult to find the trichomonads. I have been amazed at the increasing number of trichomonads which we have found in the male urethra and prostate with the combination of a new binocular microscope, a comfortable chair, and a good share of tincture of time. We have obtained our best results by using the wet smear technique, collecting the material from the urethra with a platinum loop if there is no discharge at the meatus, and mixing it with a drop of sterile saline on a clean glass slide. If there is a discharge present at the meatus, it is placed directly on a slide moistened with a drop of saline. A clean cover slip is placed on the slide and it is examined immediately with the low and high-power lens of a good microscope. If there is no discharge at the urethral meatus and trichomonads are not found in the urethra, prostatic secretion should be obtained by prostatic massage and the secretion examined for the trichomonads by the wet smear technique. Occasionally these parasites can be found in a fresh centrifuged urine specimen. In examining the wet smears we have found it useful to use the low-power lens of the microscope searching for areas where any unusual motion in the field can be observed. The trichomonads frequently become attached to debris or groups of leukocytes and in their motion may shake the entire group to which they are fastened. They can be easily identified then by using the high-power lens when any suspicious area in the slide is seen. It is also worthy of note that the trichomonads in the male often do not appear pear-shaped as they are in the female.

The bodies are rounder and somewhat larger than a polymorphoneuclear leukocyte. It may be helpful to use the vital stain developed by the Johnson & Johnson Laboratories, which stains the other material on the slide and leaves the trichomonads unstained; in this way they will stand out more clearly. Direct staining of the parasites may be accomplished by the Gram's stain, the Giemsa stain, or by Papanicalaou's method. We have not found any of these stains completely satisfactory but those who use the Papanicalaou stains consistently find a very high percentage of trichomonads, once they are accustomed to the rather bizarre appearance of the parasites. We have not tried to determine the presence of the trichomonads by cultural methods, although some workers have found this a reasonably satisfactory procedure.

TREATMENT

It has been well established that the trichomonads may be passed from an infected man to an uninfected partner during coitus. It is advisable therefore for men who have been proved to have trichomonads to use a condom during intercourse while infected and for a period of three to four months after the infestation has apparently been cleared. Conversely, it is advisable for a man whose wife is known to have a virulent infestation of trichomonads to use a condom during intercourse, and certainly advisable for a man who has been infected from his wife to use a condom when and if his infestation has been cleared, if there is any question as to the condition of his wife.

The treatment of trichomoniasis in the male is often disappointing and unsatisfactory. This is especially true in those who have involvement of the prostate. The anatomic structure of the prostate with its deep prostatic ducts provides a hiding place from which it is extremely difficult to remove these flagellate. For this reason it would seem logical that a drug which could act through the blood stream on the trichomonads, would be most useful. We have found large doses of chlortetracycline, 500 mg. given four times daily, useful in the treatment of a few of our patients. However, in other instances the trichomonads appear to thrive on the chlortetracycline. We have been disappointed for the most part in the other drugs of the "mycin" group as well as in Furadantin in the treatment of these organisms. The patients who are symptomatic as a result of secondary infection, however, are often considerably benefited by the use of the common antibiotics. Penicillin is a notable exception, because it not only does not inhibit the growth of the trichomonads, but it also rarely inhibits the growth of the common urinary pathogens. A few patients have responded to altering *p*H of the urine over a protracted period of time. We have found Mandelamine useful occasionally, alternating this with bicarbonate of soda. If the infestation is localized in the anterior urethra and has not reached into the prostatic ducts, daily urethral irrigations with small quantities of 10 per cent argyrol, 1 to 1000 acriflavine, or 1 to 20,000 Zephiran have been useful. If the infestation involves the prostate as well, we believe prostatic massage may be of some help. In spite of these measures we have failed to clear up the trichomonad infection in many of our patients.

CONCLUSION

1. Infestation in the male by *Trichomonas vaginalis* is more common than is ordinarily realized.
2. The diagnosis of trichomoniasis can be improved by measures already noted.
3. The treatment of trichomoniasis in the male is disappointing.
4. The chronic infections in the male may produce such mild symptoms that they are unnoticed by the patients and may be a constant source of reinfection in their wives.

BIBLIOGRAPHY

1. Feo, L. G.: Am. J. Trop. Med. 24:195, May, 1944.
2. Lehrman, P. R.: A study of the etiological factors in five hundred cases of nongonorrheal urethral discharge, Urol. & Cutan. Rev. 40:584–586, 1937.

The Chairman of the Symposium, Dr. Martí-Ibáñez, introduced the speaker as follows: *Ever-increasing travel facilities are making of the world one integrated unit, so much so that disease is now studied on a planetary basis. Ever since a Franciscan monk wrote, half a century before Marco Polo, the first treatise on geography and medicine, physicians have been interested in the ecologic factors of disease and the relation between geography and medicine. One of the world authorities on the subject, Dr. Jacques May, who is also an indefatigable traveler, will now talk on "The Geography of Disease."*

JACQUES M. MAY, M.D.
Head, Dept. of Medical Geography,
American Geographical Society, New York City

Geography, Travel, and Disease

A famous French playwright of the nineteenth century showed in one of his hits a character who had planned to go to Italy ever since he had completed his high school studies. Then there had been his marriage, then the birth of his children, then their marriages, then the death of his wife—until finally he was 60 years old when for the twentieth time in his life he came back home with a ticket to Rome and a bottle of castor oil in his pocket. He explained that it was wise to take a purgative before one started on a journey and that he hoped this time he would not have taken it in vain.

This supplies me with an appropriate introduction to the difficult problem to be discussed today: why is there a belief that some protective steps should be taken when one leaves the comforts of home for the unknown of foreign parts? Isn't disease the same everywhere? Or, is there any justification for taking special precautions, even going to such extremes as a purgation?

The fact is that disease is *not* the same everywhere and cannot be. What is disease? If we look up official definitions we find that disease is a departure from the norm and that the norm or health is, according to the preamble of the constitution of the World Health Organization "a state of complete physical, mental, and social wellbeing and not merely the absence of disease and infirmity." Such a definition may satisfy the bureaucrat. It is not acceptable to the scientist. Disease, as I see it, is a condition of a living cell, tissue, or individual that jeopardizes its survival in its environ-

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ment. Thus the notion of environment becomes paramount and a trait that can jeopardize survival in one place may be neutral or even favorable in another.

In short, disease expresses a maladjustment. Such a maladjustment need not remain static. In the long run it may correct itself and gradually adjustment will occur. This may be so quick as not to let us realize it, and it is likely that numerous such changes from a temporary maladjustment to an adjustment occur every day. The greater the number of these adjustments and the wider the range of foreign circumstances under which they occur, the greater the resilience of the cell, tissue, or individual. On other occasions this adjustment does not eventually take place. The result is unavoidably the death of the living thing.

Under what circumstances does such maladjustment occur? And why do certain cells or individuals show greater resilience than others? Further, what has such maladjustment or disease to do with geography?

Maladjustment or disease occurs as a result of (a) an environmental stimulus and (b) the response of the living thing.

The environmental stimuli can be *inorganic* in nature, such as cold or heat, dryness or humidity, altitude, winds, and, in short, all the elements of climate. Many books have been written on the influence of climate on health, yet, as we do not know how to isolate factors of climate from the organic factors that they promote, it is almost impossible to answer the question: what do the inorganic factors of climate just listed do to men?

Environmental stimuli can also be *organic*. They may come from the bacteria that are found in the soil and govern the crops, or from those found in the air and water which govern some diseases. They can come from the plants on which we feed that grow on the soil that serves as the habitat for the organic animal forms of life. These are important among the environmental stimuli causing maladjustment: (1) important as agents of disease, such as plasmodia, trypanosomes, amoebas; (2) important as vectors of disease, such as mosquitoes, lice, fleas, and ticks; (3) important as reservoirs of disease, such as many mammals and birds. Obviously all these factors—inorganic and organic—support man's way of life.

Man's way of life can also be termed "culture," which may be defined as "the sum total of the methods and techniques whereby man survives in his environment." As the environment differs from one place to the next, we find that the culture of the Mexican is different from that of the Canadian, and that of the Italian differs from that of the Frenchman. These various aspects of human culture provide occasions for inorganic and organic stimuli to hit the traveler and the immigrant. All these stimuli do not act independently—they combine. It is not the cold that causes pneumonia, but a pneumococcus. This bacterium would probably not cause pneumonia if we did not expose ourselves to unusually cold temperatures while in a condition of susceptibility. Innumerable patterns of such stimuli exist on the surface of the earth, all related to climate and the organic and cultural life that these climates have fostered.

But the stimulus is not everything. There must be a response from the cell, tissue, or individual. What are the factors governing this response? In which way are they related to geography?

The response of any tissue to any stimulus is governed by its genetic make-up and by its accumulated experiences—experiences which are in turn strongly influenced by the genetic make-up of the tissue.

The field of genetics is quite new, yet to the nongeneticist it is obvious that animals do not catch leprosy, that certain laboratory animals are "better" for the study of this or that disease. For a long time research on poliomyelitis was costly because only monkeys could be successfully inoculated with the virus. The mechanism of these *inborn* immunities or susceptibilities, countless examples of which could be found, is not well understood. It is probably a different mechanism from that of the *acquired* immunities, assumed to be the result of the development of antibodies in the system of the host. The genes that carry these immunities or susceptibilities also control—probably through our enzymes—the response of the living individual to many conditions of stress and to many environmental stimuli.

As for the acquired factors in the individual that govern the response to these stimuli, they can be described as "scars." Since the moment of its creation, the first cell of an individual has been the subject of innumerable stimuli from the outside to which it has successfully responded by adjustment and also by producing "scars." Some scars are observable to the naked eye, such as the immunities that result from a previous infection or the conditioned reflex that results from a previous exposure to a stress. In this short paper I cannot go into the details of this. Let us sum it up by saying that a response of the tissues is governed by the fixed genotype inherited from the parents and enriched by the biologic experience of the individual.

We said that the response of the tissue to disease stimuli was influenced by geography. How? Because the genotype is not entirely fixed, sudden changes occur which we call mutations. We do not know much about mutogenic agents but we know that among them are such factors as radiations, heat, and chemicals. All these factors differ from one place to the next, leading to the concept that mutations are not the same in one geographic environment as in another. Then natural selection occurs. It is the geographic environment that will decide whether a mutation is beneficial, neutral, or detrimental. Finally, every living thing moves—even plants, whose pollens are carried by the winds. These migrations are usually governed by the pressure of the environment and they result in a pooling and mixing of genes that create new forms of life. As for the acquired scars built up in an individual, they govern the response to stimuli as much as does the genotype. These scars reflect the environment in which the individual has lived. Thus a case is made to show that the response of the tissues to pathogenic stimuli is also governed by geography. Any understanding of the occurrence of these maladjustments which we call disease is the result of the encounter of stimuli and response factors, both of which are influenced by geography.

To illustrate the foregoing premise, we can state some examples. There is no yellow fever in Asia, but there is in South America; no yaws in the United States, but plenty in Africa; no beriberi in France, but it is found in Japan; no pellagra in Switzerland, but a lot of it in South Africa. The populations of these countries are adjusted or maladjusted to innumerable stimuli proper to their geographic location.

But what of the unsettled populations, the traveler or the immigrant? He may

not have time to adust to the numerous potential disease stimuli that await him in the lands he is going to visit. It is to prepare himself for such contingencies that my friend doped himself with castor oil, prior to taking a "dangerous" trip to Italy.

Are we still doing the same thing in our enlightened day? How can one prevent maladjustment?

There are two ways: one is to carry with you your own artificial environment to avoid exposure to the stimuli of the foreign land. This we Americans have carried to an extreme point of perfection when we produce air conditioners, filters, canned foods, and the innumerable gadgets that we expect to find in the center of Africa, in the luxurious hotels of Puerto Rico, or wherever we choose to go.

But there is another way, which is to inflict upon ourselves in a well calculated fashion the stimuli that are common in great doses in these foreign lands. We try to produce in our system in a few days or weeks the scars that the natives have produced over the years and that allow them to survive in their dangerous geographic locations. Thus we have vaccinations and inoculations, or we create an inauspicious environment for the parasites by taking aralen when we go to a malarious land. In most cases we combine the two ways, and when traveling abroad spend most of our time in artificially controlled environments with the reassuring knowledge that we have produced all the needed protective scars by immunizations before boarding our airplane.

Yet there is still the imponderable. There are things that we do not know, for which we are not prepared, that may hit us. The exhaustive study of the geography of disease, through which all this travel protection has come to us, has not yet taken away from traveling its uncertainty and calculated risk; that is not one of its smallest attractions.

The Chairman of the Symposium, Dr. Martí-Ibáñez, introduced the speaker as follows: *The time has come now for us to leave the earth and start on modern man's greatest adventure, in which the dreams of writers and the realities of scientists are converging towards the inevitable conquest of outer space. A distinguished world authority on space medicine, Dr. Hubertus Strughold, will now discuss "Medical Problems of Space Flight."*

HUBERTUS STRUGHOLD, M. D., Ph.D.
Chief, Dept. of Space Medicine,
USAF School of Aviation Medicine,
Randolph Field, Texas

The Medical Problems of Space Flight

Travel by air, developed during the twentieth century, is the most outstanding feat in the history of travel; it has reduced travel time from weeks to days, and from days to hours. Travel by air attained global dimensions when, in 1927, Charles A. Lindbergh spanned the Atlantic.

In today's long distance flights or *global flights*—as we might call them—our planes carry us with subsonic speed, under normal gravitational conditions, through the lofty but still low regions of the atmosphere, in pressurized cabins, from one place on the globe to another distant place on the globe, in a matter of a single day. Replacement of the propeller engine with the jet may eventually cut this time in half. We still fly, however, with the support offered by the Earth's atmosphere, even if some of the conditions—for instance, the cabin's air pressure—are artificially normalized. Thus, flight with prop and jet propulsion is, fundamentally, travel *by* air.

The rocket is independent of the presence of air, allowing therefore flights into the upper atmosphere and even beyond, into the vacuum of space. And yet, although the invention of the rocket engine is an event of revolutionary significance, its full exploitation towards the final goal—namely, interplanetary space travel—will probably progress in a step-by-step evolution.

Presently we are at the threshold of the first phase of space flight, and it is the complex of the medical problems encountered in this initial stage which is the topic of my discussion. By and large, these medical problems are basically the same as those that will be encountered in interplanetary space travel.

What then is the first stage of space flight? What are the medical problems involved?

In order to get clear answers to both of these questions, let us examine the physi-

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ologic environmental qualities of the altitude regions and the physiologic implications of speed found in the extreme record flights that have already been made, or that may be achieved tomorrow.

The conditions found in the atmospheric regions already reached by manned rocket-powered planes and unmanned rockets, from the standpoint of manned flight, are more or less equivalent to those in free interplanetary space.[3, 14] In fact, the greater portion of the atmosphere is space equivalent, and to cope with the conditions found in these areas, the same protective measures are necessary as those required in free space. Briefly: above 50,000 feet or about 15 km. the atmospheric function of supplying us with oxygen—for physiologic reasons—drops to zero; at 63,000 feet or 19 km. the barometric pressure becomes insufficient to keep our body fluids in the liquid state. Between 70,000 and 80,000 feet or 21 and 24 km. it is technically difficult to utilize the atmosphere to pressurize the cabin, because the air is too thin. Moreover, compressing this thin air would produce a rather high temperature in the cabin, intolerable for the occupants; and finally, the atmosphere between 60,000 and 140,000 feet is enriched by ozone: compressed to physiologic pressure, the air from these altitude levels would contain ozone in such high concentration as to be toxic. For these reasons, then, the pressurization of the cabin in the conventional manner is impossible above 70,000 feet. We must, therefore, change to a new type of cabin, the so-called "sealed cabin." This is a completely closed cabin in which the life-sustaining air must be taken along at the start. For example, oxygen consumed by the occupants in respiration must be replaced; the carbon dioxide produced in the same process must be removed; temperature, humidity, and odors must be controlled. Such are the medical problems confronted in a sealed cabin—the same type of cabin that will be built into future space ships—and will even be required

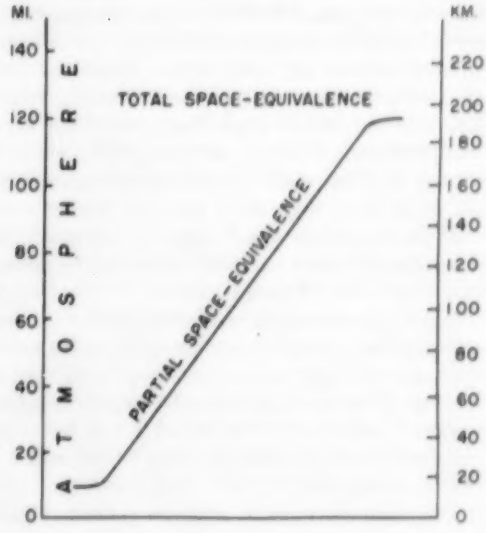

FIG. 1. The space equivalent regions within the earth's atmosphere.

at a certain altitude level well within the stratosphere. The sealed cabin craft has no life-sustaining contact with the earth's atmosphere; it is a world all its own—a little earth, a "terrella."

The USAF School of Aviation Medicine, Randolph Air Force Base, Texas, now has an experimental sealed chamber in which we can study the various climatic factors involved and the best means to control them.

At altitudes above 120,000 feet we enter an area where the protection against cosmic rays and solar ultraviolet radiation by the atmosphere ceases, and the cabin's hull must take over this atmospheric function.[6, 12, 13]

At the 75 mile altitude the cabin's hull must also take over the atmosphere's protective function against meteorites.[10, 18] For this purpose a meteor bumper or meteor screen, consisting of an outer layer of steel around the hull of the ship has been suggested.[16] The possibility of collision with meteorites, however, is rather remote.

Scattering of visible light by the air molecules—responsible for our beautiful blue daylight—also ceases at about this same altitude. This brings about the so-called darkness or twilight of space, with the stars visible at all times. But the earth reflects about 50 per cent of the incident sunlight in the form of a blue-green silvery veil. With twilight around and above, and reflected light from the Earth beneath, this indeed presents a strange situation of reversed light distribution.

So much for the physiologic qualities of the environment encountered in the extreme altitudes.

Another consideration is the movement of the vehicle through the environment encountered at extreme altitudes, with very high speed, which also reveals some novel problems of the things to come. Present-day airliners fly with subsonic speed. The experimental flight of Charles Yeager in 1948, however, when he broke the sonic barrier, placed us in the supersonic speed range, with the present record beyond twice the speed of sound, or Mach 2. At still higher supersonic speed we run into another barrier: the heat barrier, caused by friction of the vehicle with the air molecules, posing a new problem in cabin climatization. Above 120 miles or 200 km. however, the air is too thin to cause any heat effects at any speed. Beyond this thermodynamic border of the atmosphere, we encounter frictionless movement, such as that of an asteroid in interplanetary space. Above 120 miles the temperature of the cabin's hull is governed solely by the sun's radiation.

In the supersonic speed range we encounter still another phenomenon, dynamic in nature and never experienced by man in ground travel or in conventional travel by air: the state of weightlessness.

In a horizontal flight—under the pull of the earth's gravity—the airplane follows a curved line, parallel to the curvature of the terrestrial sphere. In the higher supersonic speed range, centrifugal forces begin to counteract the earth's gravitational force in an increasingly noticeable degree, bringing on the phenomenon of decreased weight or subgravity. At 10,000 m.p.h. for example, the weight of craft and crew is reduced to 60 per cent; at about 18,000 m.p.h. the state of weightlessness or zero gravity is reached.[5]

This same effect can be achieved at lower speed in a parabolic flight curve, which

is the typical path of rockets and rocket-powered planes following an initial short period of acceleration. In all of these cases of zero-gravity the rocket craft behaves like a projectile until it returns to airplane status in the denser layers of the atmosphere. The density of the atmosphere is the factor that imposes the limit for the duration of the gravity-free state. At 120 miles or 200 km. however, the density of the air is too low to offer any resistance to the moving craft, thus allowing permanency of the gravity-free state. This level has been termed "the mechanical border" of the atmosphere. This survey shows, indeed, that the greatest portion of the atmosphere exhibits conditions equivalent to free space (fig. 1). In the area between 10 miles or 15 km. and 120 miles or 200 km. where we encounter one or several—but not yet all—factors typical of space, we deal with partial space equivalence. Above 120 miles, however, if we ignore some variations caused by the bulk of the earth, its speed, its magnetic field, and its own and reflected radiation, we face total atmospheric space equivalence. This level is the final functional border between atmosphere and space. Above this level the atmosphere is recognizable, from the standpoint of manned flight. In terms of the meteorologist or the astrophysicist, however, it ends at an altitude of 600 miles.

Today's manned rocket-powered craft have already advanced well into the area of partial space equivalence, passing beyond at least three important space equivalent levels. Animal-carrying rockets have left nearly all of them behind. Unmanned two-stage rockets have penetrated deep into the heart of total space equivalence. From a physiologic and technical point of view, we are at present in the *partial space equivalent* phase of manned flight, a fact of far-reaching significance with regard to travel in the immediate future.[14]

At the beginning of this paper we defined the present long distance flights as "global flights." The coming phase of travel can be termed "*global space flight*." We stay on the globe but fly under space equivalent conditions, or, more precisely analyzed: rocket powered planes will take us at supersonic speed, under subgravitational conditions, in a sealed cabin through the space equivalent regions of the atmosphere, from one place on the globe to another distant place on the globe in a matter of a few hours.[5] The medical problems involved are of immediate concern; the most important one is that of climatizing the cabin. With the combined efforts of the engineer and the physiologist, this problem so vital to the safety of the passengers will, no doubt, be solved.

The strangest condition that the passengers will experience in this sort of flight is the state of decreased weight, reduced dynamically, as already mentioned. In the supersonic speed range to be expected, the reduction of weight will be slight—perhaps 20 to 40 per cent. I do not anticipate difficulties for the passenger from these subgravitational conditions. I rather expect a feeling of exhilaration. In the case of complete weightlessness, the story might be different. It is still too soon, however, to say whether zero-gravity will represent a serious medical problem or merely an interesting psychophysiologic phenomenon.[7, 9] Expressed in a simple way: in global space flight—with regard to gravitation—the passengers fly partially under airplane conditions as in conventional global flights, and partially under ballistic conditions like a bullet or a meteorite.

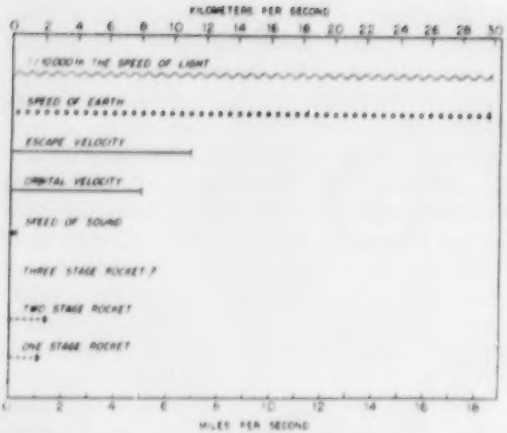
KILOMETERS PER SECOND
0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
1/10000th THE SPEED OF LIGHT
SPEED OF EARTH
ESCAPE VELOCITY
ORBITAL VELOCITY
SPEED OF SOUND
THREE STAGE ROCKET ?
TWO STAGE ROCKET
ONE STAGE ROCKET
0 2 4 6 8 10 12 14 16 18
MILES PER SECOND

FIG. 2. Speed records in rocket flight compared with speed of sound, orbital velocity, and escape velocity.

These are the essential problems involved in the first stage of space flight, namely, in global space flight. They are problems encountered *during* such flights. There is also an interesting problem which presents itself after the completion of such flights; in fact, already we must reckon with it today after conventional global atmospheric flights. It is the phase shift between the physical and physiologic day-night cycle after long distance flights. This has been discussed elsewhere.[15]

In conclusion, I would like to touch upon the extension of global flight and global space flight into interplanetary space travel.[2, 4, 11] As previously mentioned, at 18,000 m.p.h. or 5 m.p.s. the state of zero-gravity is reached. This is the so-called orbital or circular velocity, the speed which will enable a craft to circle around the globe in a fixed circular orbit as an artificial satellite. This eventual stage may be called *circumglobal or orbital space flight*. The medical problems involved are similar to those in global space flight except that here we deal with the gravity-free state over a longer period of time and possible cosmic radiation hazards.[1] Also, the physiologic day-night cycle of the crew must be kept in balance. All this holds true for the next and final stage: with increasing speed, at 7 m.p.s., the craft will break away from the gravitative control of the earth and escape into the depths of interplanetary space (escape velocity). This then will be *interplanetary space travel*.

As figure 2 shows, at present we have reached, in a two-stage rocket, 30 per cent of the orbital velocity and 20 per cent of the escape velocity. A three-stage rocket or an atomic rocket may bring in the remaining per cent. Meanwhile, we in the medical field will endeavor to solve the medical problems involved in all the stages of manned flight, global flight, global space flight, circumglobal or orbital space flight, and interplanetary space travel. Global space flight, however, is that stage of human flight that is immediately before our door.

BIBLIOGRAPHY

1. ARMSTRONG, H. G.; HABER, H., AND STRUGHOLD, H.: Aeromedical problems of space travel, J. Aviation Med. 20:383, 1949.

2. VON BRAUN, W.: The Mars Project, University of Illinois, Urbana Press, 1953.
2a VON BRAUN, W.: The early steps in the realization of the space station, J. Brit. Interplanetary Soc. *12*:23–26, 1953.
3. BUETTNER, K., AND HABER, H.: The aeropause, Science, *115*:656, 1952.
4. CLEATOR, P. E.: Into Space, London, G. Allan & Unwin, Ltd., 1954.
5. DORNBERGER, W.: Flights at the border of the atmosphere, J. Aviation Med. *26*: no. 5, 1955.
6. EUGSTER, J.: Weltraumstrahlung Medizin. Bern und Stuttgart, Verlag Hans Huber.
7. GERATHEWOHL, S.: Physics and psychophysics of weightlessness, visual perception. J. Aviation Med. *25*:412–419, 1954.
8. HABER, F., AND HABER, H.: Possible methods of producing the gravity-free state for medical research, J. Aviation Med. *21*:5, 1951.
9. HENRY, J. P.; BALLINGER, E. R.; MAHER, P. J., AND SIMONS, D. G.: Animal studies of the subgravity state during rocket flight. J. Aviation Med. *23*:421, 1952.
10. LAPAZ. Meteoroids, meteorites, and hyperbolic meteoritic velocities, see ref. 17.
11. OBERTH, H.: Wege zur Raumschifffahrt. Muenchen, R. Oldenburg, 1929.
12. SCHAEFER, H. J.: Exposure hazards from cosmic radiation, J. Aviation Med. *23*:334, 1952.
13. SIMONS, D. G., AND STEINMETZ, C. H.: Physiological and radiobiological aspects of 1954 aeromedical field laboratory balloon flights, J. Aviation Med. *26*:1955.
14. STRUGHOLD, H.: Space equivalent conditions, Astronautica Acta *1*:32, 1955.
15. STRUGHOLD, H.: Physiological day-night cycle after global flights. J. Aviation Med. *23*:464, 1952.
16. WHIPPLE, F. H.: Meteoritic phenomena and meteorites: Ref. 17.
17. WHITE, C. S., AND BENSON, O. O., JR.: Physics and Medicine of the Upper Atmosphere, Albuquerque, University of New Mexico Press, 1952.

HUBERTUS STRUGHOLD, M.D., Ph.D.
Chief, Dept. of Space Medicine,
USAF School of Aviation Medicine,
Randolph Field, Texas

Physiologic Day-Night Cycle After Long Distance Flights

All life processes occur in rhythms or cycles. Some of the biologic cycles are closely related to astronomical events, such as sunspots, the revolution of the moon around the earth, and especially the rotation of the earth about its axis and its revolution around the sun. The most impressive of all these cycles is that associated with the earth's rotation about its axis. This rotation within the powerful radiation field of the sun brings about periodic changes in illumination, temperature, and other environmental factors over the entire globe. This external, astronomical, or physical cycle, with the two phases of day and night, has imposed upon living beings, in the course of their paleologic development, an internal physiologic rhythm known by the term "physiologic diurnal rhythm" or "physiologic day-night cycle," manifested by alternate phases of rest or sleep and wakefulness or activity, and also manifested by rhythmic changes in respiration, circulation, digestion, body temperature, electroencephalogram, etc. Literature in this field is extensive;[2, 4, 6, 11] the most comprehensive survey is offered in the book *Sleep and Wakefulness* by N. Kleitmann.[3]

The physiologic day-night cycle, as a kind of conditioned reflex synchronized with the physical event of day and night, is firmly established in man and in a number of the higher animals. This is especially demonstrated by the fact that a shift in the phases of the physiologic day-night cycle cannot be achieved instantly. Rather, it demands a certain amount of time for readjustment. This is a familiar problem in work shifts in factories, mines, and hospitals, in watches on ships, etc.

The physiologic day-night cycle has now become a problem in travel. Here the phase shift in the diurnal cycle is caused simply by traveling with or against the rotation of the earth, along the latitudes, across the meridians, or along the meridians across the poles. The effect comes from the local differences in time between the points of departure and arrival. In such vehicles as ships, trains, and automobiles, the difference amounts to slightly more than one hour per day. This slight change may be uncomfortable; physiologically, however, it is insignificant. But when we fly across the Atlantic and cross 100 meridians we experience a time shift of about a quarter of a day. We are adjusted to the local time of the place where we took off. This time is, so to speak, our internal physiologic time. As a consequence, our physiologic cycle fails to match the new geographical diurnal cycle at the place where we land, leaving a gap of some five or six hours.

This is demonstrated in figure 1. The outer area of the squares shows Greenwich or World time; the outer circle shows local time; the inner circle, physiologic time. The darkened area indicates night, and the shaded area is the normal time of sleep.

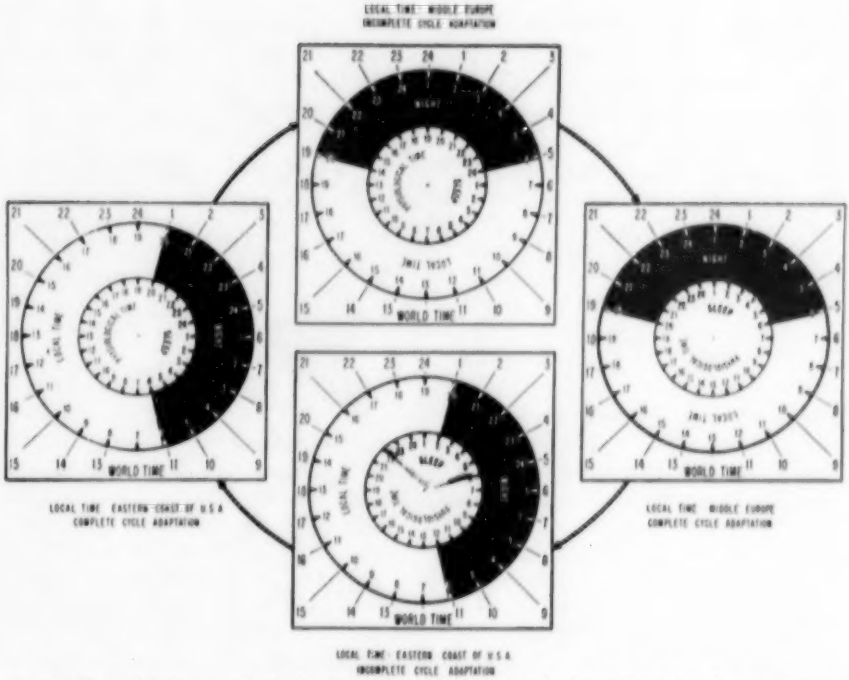

FIG. 1. Phase shift between physical and physiologic day-night cycle after a flight from the eastern coast of the United States to Middle Europe and return.

This figure presents the situation after a flight from the East coast of the United States to Middle Europe and return. The left diagram indicates the physical and physiologic day-night cycle in New York or Washington, D. C. The figure in the upper center shows the physical time change by five hours on arrival in Europe. The physiologic day-night cycle remains the same. About a week later, it again coincides with the physical day-night cycle, as shown in the diagram on the right. Reading the figure from right to lower center and left demonstrates behavior of the physical and physiologic cycles after a trip from Middle Europe to the East Coast of the United States.

The physiologic effect produced by the discrepancy between the geographic and physiologic day-night cycle—after long distance flights—can be termed a "geographic-physiologic phase shift in the day-night cycle" or "incomplete time or cycle adaptation." During this incomplete time adaptation, the newcomer's physiologic cycle, or "metabolic clock," behaves as though he were still in the area he just left, and it will take several days or more before he adapts himself physiologically to the local time of the new place. There is no question that the majority of people are sensitive to a phase shift in the day-night cycle. So much for the physiologic side of the problem.

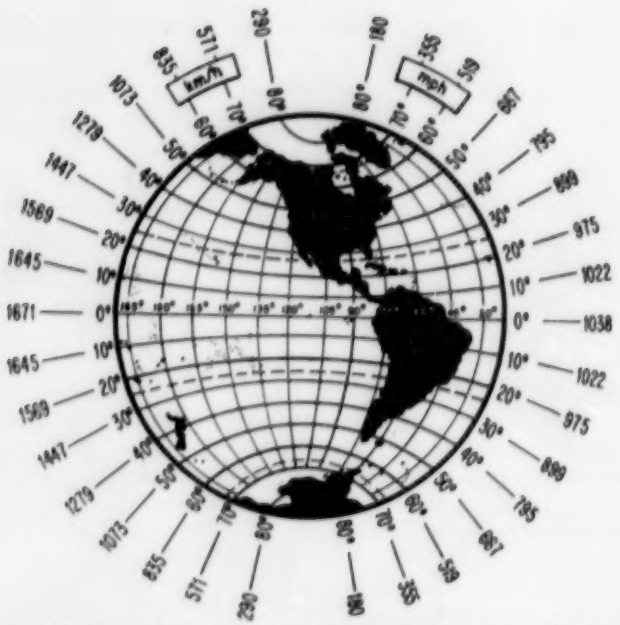

FIG. 2. The speed at which daylight progresses around the globe at various latitudes expressed in miles per hour and kilometers per hour.

The geographical time shift is four minutes per meridian, or one hour per 15 meridians. A five to eight hour difference is easily achieved by the conventional planes in a single day on the usual flight routes between the 30th and 50th parallels. When planes travel at 600 m.p.h., a time difference of 12 hours, corresponding to 180 meridians, will be possible within one day, and in the supersonic speed range, in a few hours, thus entailing a complete cycle inversion. The same can easily be achieved in flights across the poles.

If we fly in the middle latitudes with the speed of daylight (fig. 2)—about 700 miles per hour—leaving Paris for New York at noon or lunchtime, after five hours of flight, we arrive at noon or lunchtime, but the body says that it is evening and time for dinner.

These examples may suffice to show the complexity of the physiologic time factor after long distance flights. This has been discussed more in detail in the paper of reference 5.

The phenomenon of incomplete cycle adaptation imposed by travel is important in present-day long distance flights, which may be called global flights* and even more so in the future global space flights,† with regard to the following points:

* Global flight = long distance flight through the lower atmosphere at subsonic speed.

† Global space flight = long distance flight through the space equivalent regions of the upper atmosphere at supersonic speed.

The time element should be considered in scheduling the sessions for meetings of diplomatic, economic, or other missions, after long distance flights. As a rule, during the first two or three days after flights that involve the crossing of five or more time zones, meetings of a decisive nature should not be scheduled in the morning at the end of eastbound travel, nor during the afternoon following westbound trips. Furthermore, this matter should be considered of importance for lecturers, actors, and participants in tournaments (chess, Olympic games, etc.) that require maximum mental and /or physical efficiency.

The time element is of special medical interest with regard to taking the body temperature in feverish diseases and the treatment of sick people after long distance flight.

It is of interest, finally, regarding the permissible frequency of change in cycle for the pilots.

The question may arise, "Is this a serious medical problem?" Not necessarily! However, it has many implications and if questions arise in this respect—and they most certainly will—then the medical doctor should have the answer. The problem has nothing to do with the flight as such, nor does it represent an aftereffect of the flight. It merely represents a concomitant phenomenon induced by a speedy and long-range change of location by flight.

In travel by land or sea, the time shift remains at intracontinental and intraoceanic ranges. In modern global flights and global space flights, it reaches the level of intercontinental and global dimensions.

We have now reached the point in flight where we must consider the earth not merely as the good old "terra firma" of the ancients, but rather as a rotating planet. This is best demonstrated by the fact that if a craft flies in the middle latitudes in a westerly direction with supersonic speed, higher than the rotational speed found in this belt of the earth (see fig. 2) the sun will be left behind, and the passengers will encounter the strange spectacle of a "sunset in the East."

BIBLIOGRAPHY

1. De Rudder, B.: Ueber sog. Kosmische Rhythmen beim Menschen, Stuttgart, Georg Thieme Verlag, 1948.
2. Jorm, A.: Die 24-Stunden Periodik in der Biologie. Tabulae Biologicae, Vol. XIV, Uitgeverij, Dr. W. Jung, Den Haag, 1937.
3. Kleitman, N.: Sleep and Wakefulness, Chicago, The University Press of Chicago, 1939.
4. Kleitman, N.: Biological rhythms and cycles, Physiol. Rev. 29 No. 1, 1949.
5. Strughold, H.: Physiological day-night cycle after global flight. J. Aviation Med. 23:464, 1952.
6. Welsh, J. H.: Diurnal rhythms. Anat. Rev. Biol. 13:123, 1938.

The Chairman of the Symposium, Dr. Martí-Ibáñez, introduced the speaker as follows: *Food, a highly important index of human culture, differs in all countries. The multiple changes in food while traveling are a health problem well deserving of careful attention. Colonel Miriam Perry, a distinguished authority on nutrition as related to air travel and a most charming lady of science, will now talk on "Nutrition and Air Travel."*

COL. MIRIAM E. PERRY

Chief, Women's Medical Specialist Corps,
United States Air Force, Office of Surgeon General,
Washington, D. C.

Nutrition and Flight

New frontiers of science and medicine have opened up with the advent of modern aircraft which are capable of cruising at transsonic speeds, climbing several miles per minute and operating effectively at 50,000 feet or higher. Such high-speed, high-altitude flying imposes severe physiologic stresses on the pilots and other crew members. Many problems have been solved by the aeronautical architects and engineers through refinement of aircraft designs and the development of protective mechanical aids. Even with these aids, however, man cannot operate planes safely, effectively, and at full capacity unless he is in peak physical condition and his body is functioning at maximum efficiency. This means that his body must be as unhampered as possible by physiologic strains which result under the special conditions imposed by flight.

In aviation, the demands upon the compensatory mechanisms of the body are numerous and of considerable magnitude, especially in the high-altitude aircraft or in nonpressurized craft at relatively low altitudes. The environmental changes of greatest physiologic significance involved in flight are (1) marked changes in barometric pressure, (2) considerable variation in temperature, and (3) movement at high speed in three dimensions.

One of the most frequently experienced effects of altitude, due to the rapid decrease in atmospheric pressure, is the discomfort caused by gas within the digestive tract. Fortunately, the symptom is not serious in most individuals. In flights above 25,000 feet, however, enough distension may occur to produce severe pain. Pressure exerted by this expansion may cause cramping, interfere with digestive processes, produce heartburn or dizziness and interfere with respiration. The chief sources of these gases in the intestinal tract are swallowed atmospheric air and, to a lesser

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extent, gas formed as a result of digestive and other intestinal processes. Another strain on the human body is the noise from the propellers, exhaust, etc., and for the pilot, from the aircraft radio. The vibrations of the ship also take a toll of physical and nervous energy which is cumulative in effect over a period of several hours. These stresses, too, have a definite effect on the peristaltic action of the stomach and intestines, with a resultant slowing down of the digestive processes. Cold, mental strain, and fear may further retard the processes.

Obviously the airborne human should be in a state of optimum health in order to meet the demands and withstand the effects of flight. While a daily nutritious diet is of utmost importance and the basis of optimum health, special consideration must also be given to the selection of foods eaten before, during, and even after flight. It is important not only that they be palatable and adequate in quantity and nutritional value, but also that they be designed specifically to avoid, counteract, and eliminate the malfunctions caused by environmental conditions of flight. The *degree* to which dietary modifications will be required will depend on the type of aircraft, the altitude at which the mission is being flown, the length of the flight, individual idiosyncracies, and the physical and mental state of the man himself. It should, therefore, be remembered that the dietary regime suggested here is intended to serve only as a guide and not as hard and fast rules for use under all conditions or by all individuals.

It is unnecessary to define for this audience either the components of a balanced diet or the emotional factors which affect the utilization of that diet by the human body. You may, however, be interested in hearing a brief summary of certain points concerning their daily diet which we try to impress on our flying personnel. In some Air Force Commands the wives are also receiving orientation and instructions with regard to the special dietary requirements of their husbands. In pointing up the importance of a well-rounded daily diet, they are reminded that a mere absence of disease is not necessarily an indication of an optimum state of health and that a daily diet which does not include all the essential nutrients can result in "hidden weaknesses" which in turn could lead to disaster under conditions of undue strain. Another point which is stressed is the fact that while a diet may be adequate in all the essential nutrients and in calories, it may still be inadequate if not properly absorbed and utilized by the body. The effects of fatigue, anger, and fear on digestion are also pointed out. The wives are reminded that family and financial problems are not fit guests for the dinner table and that they should make every effort within their power to safeguard their husbands' peace of mind prior to his flight.

During the past few years there has been an increasing amount of discussion about the selection of foods for pre-flight and in-flight meals, with emphasis being placed on the omission of gas-producing foods. This omission is important, but there are other factors which enter into the picture. As it has been pointed out previously, the extent to which they must be taken into consideration will depend on the individual, the type aircraft, the altitude, and the length of the mission.

It is recommended that a pre-flight meal be eaten one to two hours prior to take-off and that the food items be selected with care. "Heavy" meals that are hard to digest or are gas-producing in nature overload the digestive and excretory organs

and hamper flight efficiency. For that reason pre-flight meals should be light, bland, palatable, easily digested, and satisfying. Foods which should be eliminated—or considered for elimination in the light of the flight involved—are:

Foods which are greasy or insufficiently cooked,
Highly seasoned foods and condiments,
Gas-forming foods,
Foods high in roughage,
Foods to which the individual is allergic or does not tolerate well,
Alcoholic and carbonated beverages (It is important for pilots not to drink alcoholic beverages at least 12 and preferably 24 hours prior to flight; carbonated beverages 1 to 2 hours prior to flight).

The principles and limitations which apply to pre-flight meals are also applicable to in-flight meals. They should be light, bland, palatable, satisfying, and nutritious. In addition, it is important to remember that long periods of fasting and insufficient amounts of fluids cause unnecessary fatigue, slower reactions, inability to concentrate and in extreme cases blurred vision. If the food intake is to be most effective, it is recommended that small amounts be eaten at two hour intervals with a light meal every four hours, if possible. In flight there is an increased requirement for fluids. This is apparently due to a combination of conditions—less ambient humidity and increased perspiration due to nervous or emotional tension. For that reason, special attention must be paid to the intake of adequate amounts of fluid to meet the needs of the flight. For maximum pilot efficiency at the moment of landing, a light meal one to two hours prior to the expected time of arrival is recommended.

In rounding out the meals for the day, we come to the post-flight meal. The purpose of this meal is to provide proper nutrition and restore the body to maximum efficiency as rapidly as possible after the physical and mental strain of the flight. A period of rest prior to eating is essential in order to give the body time to relax and "unwind" from fatigue and tension. When fatigue is extreme, it is recommended that a full meal be postponed in favor of a light snack following the period of rest.

In conclusion, I will briefly summarize the major points which have been covered. The airborne human is subject to certain definite and sometimes critical physiologic stresses against which mechanical aids alone cannot provide protection. In order to withstand these stresses most effectively, the individual must be in peak physical condition. With a nutritiously adequate daily diet as the basis, certain modifications in relation to flying activities may be required in varying degrees, the extent of the limitations being dependent upon the individual, the type aircraft, the length of the flight and the ambient atmospheric pressure.

FELIX MARTI-IBAÑEZ, M.D.
International Editor of
INTERNATIONAL RECORD OF MEDICINE
AND GENERAL PRACTICE CLINICS

New Perspectives of Health and Travel

A SUMMATION OF THE SYMPOSIUM

We have now come to the end of the journey through time and space on which this First International Symposium on Health and Travel set out this morning.

The philosophical principle that guides medicine as applied to travel is that the constancy of the inner milieu of the traveler must be maintained, a principle already conceived in the nineteenth century by Claude Bernard.

Two main techniques are used today to translate this principle into reality: first, to protect the traveler by means of drugs and physical agents against the dangers originating *within* his person, such as motion sensitivity, stress, psychosomatic reactions, and the aggravation of already existing organic diseases. Second, to protect the traveler against the dangers originating *without* his person by helping him take with him as much as possible of his habitual environment, as if he were a Robinson Crusoe carrying with him his own private little island.

Among these external measures are pressurized cabins with uniform temperatures, mechanical devices to reduce excessive motion in ships and planes, special diets, and the administration of antibiotics for protection against or to fight infection.

The main problems studied in this Symposium can be grouped into five categories:

I. THE PROBLEM OF MOTION SENSITIVITY

The moment that man moves in any kind of vehicle—car, train, ship, or plane—he is exposed to motion sensitivity, which may affect even the most experienced sailor or the most daring air pilot, regardless of his physical strength or moral fortitude.

Motion sensitivity is probably the greatest menace to the health, comfort, and pleasure of the traveler; it may disturb him both physically and mentally, making his trip one of agony instead of pleasure.

Motion sensitivity develops with such common early symptoms as general apathy, disinterest in the environment, pallor, respiratory anguish, mental depression, cold sweat, chills, headache, subnormal pulse and temperature, hypersalivation, and, when motion sensitivity finally becomes frank motion sickness, nausea and vomiting. The chain reaction of physiologic events that leads to motion sensitivity is set off by the motion of the traveling vehicle; it includes labyrinthic, extralabyrinthic, and

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psychogenic factors as well as pure hypersensitivity or idiosyncrasy, which in some individuals becomes a true allergy to motion. Motion sensitivity can be successfully prevented or treated with the new anti-motion sickness drugs, such as meclizine and similar compounds.

II. THE PROBLEM OF STRESS

Stress, that physiopathologic taxation of civilization, is one of the main etiologic factors of disease in the traveler. The usual causes of stress are nonspecific factors such as excessive fatigue, mental exhaustion, overexposure to sun, air, water, heat, cold, and motion, as well as an excess of visual impressions. We may also add the mental tension created by the necessity to cope with new horizons, faces, and foods and strange languages, all of which are encountered in every journey no matter how pleasant it may be. Furthermore, there is also a biologico-philosophic factor of the utmost importance in the cause of stress in travel—that is *change*.

Man lives consciously through his brain and emotionally through his hypothalamus, and he establishes liaison with the outer world through his endocrine system. Between stress causing factors and man's organism, which may react to stress with a series of psychosomatic and even organic conditions, stands only the defensive curtain of his adrenal cortex. All that protects the human being against the nonspecific aggression of stress is a tiny bit of a gland, the adrenal. In the strength of the adrenal cortex lies the key to the successful resistance of the traveler to the burdens of stress.

Human tissues are vulnerable to the menace of the stimuli unleashed by any change of environment. Although not specifically noxious, these stimuli however can, by merely altering the normal interrelationship between the human being and his environment, threaten the constancy of the inner milieu. On the capacity of the adrenal cortex to adapt the organism to the continuous *changes* entailed in a journey depends whether the traveler returns to his original environment in good health.

To fight stress, aeromedicine, naval medicine, and the technical industries connected with travel have created artificial environments which mimic all the conditions of the traveler's familiar environment. They protect him against sudden external changes by making available to him vehicles with uniform temperatures, adequate lighting, proper atmospheric pressures, noise reducing devices and choice of proper diet. Adequate mental and psychosomatic hygiene will further help the traveler to bear these external circumstances and avoid the increase of stress, that unavoidable price we pay for being human.

III. THE PROBLEM OF INFECTION

Throughout history infection has been the greatest threat to the traveler. Today it is perhaps the easiest one to fight. In the past the fight against infection was *passive*, being limited to isolation of the sick traveler by the classical quarantine in order to protect the other travelers. Today the fight against infection is *active*. Infection is considered the result of the interaction of two factors: the etiologic infectious agent and the human organism host to the infection. To fight the etiologic

agent we now use antibiotics, especially the broad-spectrum antibiotics, either as prophylactic or therapeutic agents. We also use new pesticides and disinfectants to make habitable and safe huge areas of the earth which centuries ago were colossal cauldrons in which malaria, cholera and other dreaded germ broths brewed perennially. The fight against epizooties has contributed to this global hygienization, although there is still much to be done to render all human dwellings on this planet healthy. To strengthen the traveler's organic defenses we are using biologic immunization such as vaccines, toxoids and serums. We also use hygienic measures, special regimens and vitamin supplementation to reinforce his organic strength. But, above all, it is through the therapeutic use of the broad-spectrum antibiotics, such as oxytetracycline and other tetracyclines, that we can today arrest the development of an incipient infection, restore the sick traveler's health, and protect his traveling companions from the risk of contagion.

IV. THE PROBLEM OF NUTRITION

Food is one of the most important indexes of the culture and economic progress of a nation. Adequate nutrition for the traveler, as provided nowadays in planes, ships, trains and hotels the world over, protect him against the insufficient, inadequate or toxic alimentation which was formerly a frequent cause of disease among travelers.

If we must eat to live and not live to eat, then we must learn what to eat in order to travel, like airpilots, and not travel merely to eat as did Brillat-Savarin.

Disease, nutritional or otherwise, develops at different levels, of which the one most recently studied is the tissue level, to which may soon be added a subtissue level comprising the physiochemical and bioelectric changes in cell activity. The best way to enable the tissues to resist trauma, infection, or stress is to nourish them adequately. The healthy nutritional diets available today while traveling, and the proper supplementation of these diets with vitamins and minerals, permit the traveler to face the stress of travel and other medical travel risks with a good probability of overcoming them.

V. THE GEOGRAPHIC PROBLEM OF DISEASE

The ever growing knowledge of the geography of disease—the geography of infections, nutritional deficiencies, parasitic infestation, and other diseases—is a priceless tool in planning the fight against disease and in safeguarding the traveler.

If disease is caused by maladaptation of the traveler to his environment and the inadequate response of his living tissues to environmental stimuli, the only way to make our planet safe and comfortable is to know thoroughly the geography of diseases in order to protect ourselves against them. Protection against disease, then, is conditioned by transporting *together with the traveler* the basic factors—food, clothes, artificial climate—of his familiar environment and by the use of antibiotics, antimotion sickness drugs, nutritional factors, etc., that help him fight from *within* his body, from the tissue level, the specific menace—trauma, microbes, toxic agents—

or the nonspecific menace, stress, originating in the new environment to which his travels take him. The new global philosophy in the fight against disease, by extending to the entire planet those prophylactic and curative measures and drugs which in the past were limited to the great capitals only, must inevitably change the geography of disease into the geography of health. We should then be able to use this geography of health as a blueprint of happiness to show us how to make the best use of health factors—sunshine, fresh air, pure water, and fertile lands—wherever available in our travels around the world.

L'ENVOI

When, according to Greek mythology, beautiful and inquisitive Pandora opened the box given her by Jupiter and let fly all the miseries and evils that afflicted man, only Hope was left. On this planet of ours, where land and sea have already been conquered, Hope is represented by Medicine, which will make possible space travel—man's new goal—and the conquest of peace and health on the shoreless ocean of Time.

INTERNATIONAL RECORD OF MEDICINE AND GENERAL PRACTICE CLINICS

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Footnotes and Bibliographies should conform to the style of the Quarterly Cumulative Index Medicus published by the American Medical Association. This requires, in the order given, last name of author, initials, title of article in the language in which it was written, name of journal with accepted abbreviation, volume number, page number, and year.

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INCORPORATING INTERNATIONAL RECORD OF OPHTHALMOLOGY

FOREWORD

The objective of the QUARTERLY REVIEW OF OPHTHALMOLOGY is to bring together in one publication concise but authoritative abstracts of current articles on ophthalmology, according to an all inclusive plan which includes all special, state, and national journals as well as the bulletins of clinics, hospitals, etc., and the transactions of meetings. This embraces both the domestic and foreign literature.

To assist the reader to locate quickly the articles of current interest all data are classified and published according to the following systematic plan:

Anatomy, Embryology, Heredity, Development and Nutrition

Optics, Physiology and Psychology of Vision

Physiology, Chemistry and Biochemistry of the Eye

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Book Reviews

Announcements

A section entitled International Record of Ophthalmology is included at the beginning of the journal. The Record Section consists of advanced clinical and experimental reports.

Quarterly Review of **OPHTHALMOLOGY**

ABSTRACTS

ANATOMY, EMBRYOLOGY, HEREDITY, DEVELOPMENT, AND NUTRITION

67. *Mandibulofacial Dysostosis and Status Dysraphicus.* BRANKO NIZETIC. Ophthalmologica *127*:1–13, Jan. 1954.

A typical case of mandibulofacial dysostosis is reported. The subject's parents, brothers, and sisters showed slight constitutional anomalies that could be considered as manifestations of status dysraphicus, that is of disturbed closure of the neural tube.

68. *Congenital Hydrocephalus and Hypoplasia of the Anterior Segment of the Eyeball.* C. SAPUPPO. Boll. d'ocul. *33*:65, Feb. 1954.

The patient, examined at the age of 7 years, showed aniridia, hydrophthalmos and coloboma of lens, and zonule of Zinn of the left eye. A photograph of the patient, of the lens under lower power magnification, photomicrographs of the anterior segment, chamber angle, and optic nerve amplify the description. The right eye was grossly normal with a moderate myopia and the right optic nerve was slightly pale and had hazy borders. The pathogenesis is discussed.

OPTICS, PHYSIOLOGY, AND PSYCHOLOGY OF VISION

69. *The Importance of the A.C.A. Ratio in Industrial and School Success.* C. JANE DAVIS AND FREDERICK W. JOBE, Rochester, N. Y. Am. J. Optom. & Arch. Am. Acad. Optom. *31*:521–532, October 1954.

The A.C.A. ratio is almost a biologic constant. It represents the relationship between the amount of accommodative convergence to the actual amount of accommodation in use. This measurement has been found to be unrelated to age, training, or change in prescription. For this reason it is ideal for statistical use where experience and age may play a large factor, requiring partialing of factors to eliminate bias.

Since the Bausch & Lomb Occupational Research Center had long been plagued by difficulties with experience in age factors, this seemed an ideal measurement for use in relationships between vision and job success. It was possible to obtain the crude A.C.A. ratio from the lateral phoria scores which were available on ortho-rater vision tests on a large number of individuals with proven job performance.

A number of industrial studies in the files were analyzed in relationship to this measurement. Results were quite encouraging but rather unusual. It was found that some jobs seemed to require a high A.C.A. ratio and others a low A.C.A. ratio for success. It was particularly interesting that several jobs within the same plant might have opposite requirements, suggesting that interchange of individuals between jobs might result in more satisfactory performance.

A similar analysis of school children in the University of Chicago studies revealed some relationship between the A.C.A. ratio and certain measures of school success. In this case, it was found that grades that had had reading training no longer carried the requirements of the A.C.A. ratio. It was apparent that this particular ability could be overcome by training in proper reading habits. The value of these findings is uncertain, though it seems apparent that some further study would be valuable. 14 references. 9 tables.—*Author's abstract.*

70. *An Evaluation of Vertical Divergence Tests on the Basis of Fixation Disparity.* RICHARD A. TUBIS. Am. J. Optom. & Arch. Am. Acad. Optom. *31*: (12) 624–635, December 1954.

Nineteen subjects with concomitant vertical imbalances ranging from ½Δ to 3Δ were selected for this study.

Vertical ductions were induced on each subject, using as a target, a panoramic screen allowing peripheral fusion only. With each forced divergence, fixation disparity was measured by the adjustment of two polarized vernier lines seen foveally.

The vertical prism power necessary to neutralize the fixation disparity (representative of the "fused phoria") was ascertained and compared with standard clinical tests for vertical imbalance as: the fusion-free phoria test, the duction break and recovery test, and the red glass test.

The diplopia prism test was found to be the most reliable ($r = +0.919$), generally exceeding the fused phoria in amount. This discrepancy was attributed to the compensating fusion reflex operative during binocular fixation. When reduced in value by 25 per cent, the diplopia prism test is a reliable predictive measure of the fused phoria.

Duction break points, when balanced by a prismatic value, correlate in both directions and generally amount with fused phoria ($r = +0.723$), but prediction of one from the other is prohibitive. The balancing prism exceeds the fused phoria as did the diplopia test.

Duction recovery points, when balanced, and the red glass test were found to be of questionable reliability when used to predict the fused phoria. They are of

value in substantiating the presence and direction of vertical imbalances when they are found to exist.

71. *The Appearance of Hyperphoria Immediately Following Parturition—A Case Report.* MARIAN K. EAKIN AND ROBERT S. EAKIN, Los Angeles, Calif. Am. J. Optom. & Arch. Am. Acad. Optom. *31*:493–497, October 1954.

A myopic astigmat who had suffered severe asthenopia for all distance activities showed a marked right hyperphoria for the first time immediately after the birth of a child. Correcting the hyperphoria fully gave ocular comfort for the first time. There were several changes in the hyperphoria, both increase and decrease, in the next three years, but nothing of any significance even after the birth of a second child. The case records are quite complete and show that the hyperphoria varied from 2Δ to 6Δ right; there was no particular reason for the variations.

A few very tentative causes are suggested with a short discussion of each. The authors do not advocate parturition as a cure for asthenopia, but rather that the hyperphoria measurements be made with great scrupulosity, especially on asthenopic patients. 9 references. 1 table.—*Author's abstract.*

72. *Ascorbic Acid in the Physiology of Color Vision.* J. BIERNACKA-BIESIEKERSKA AND M. SZCZYGLOWA. Klinika Oczna. *24*:1, 1954.

The relation between the level of vitamin C in the blood and the size of the visual field for green was determined in 43 adults. Visual fields for green were taken, the level of vitamin C was checked, and vitamin C was given orally in amounts from 100 to 500 mg. per day for at least one week. The authors found a definite correlation between the vitamin C blood level and the size of the visual field for green. Small fields for green may be used as indication of vitamin C deficiency. There are seasonal variations in the size of the visual fields for green, and the vitamin C blood level was lowest in the early spring and highest in the fall. Seasonal variations in color perception may be related to the vitamin C level in the organism.

PHYSIOLOGY, CHEMISTRY, AND BIOCHEMISTRY OF THE EYE

73. *The Dehydrases of the Cornea. Second and Third Communication.* JAEGER WOLFGANG. Arch. f. Ophth. *154*:401, 1953.

A former study reported the role which the corneal dehydrases play in the metabolism of carbohydrates. Using the same method as before, the author continued his work and studied the effect of a number of toxic substances upon the activity of the corneal dehydrases. He found that acids and bases unspecifically destroyed the enzymes, and copper salts inhibited their activity. Numerous other toxic substances also produced inhibition and simultaneously caused corneal in-

flammation. Snake venom and bee stings especially acted in this way and produced severe inflammatory reaction of the conjunctiva and cornea. Bacterial toxins tested so far had no effect upon the dehydrases.

In the third communication, studies of the action of therapeutically used drugs in their influence upon the dehydrases are reported. Examinations of rabbits' eyes in vivo were made. The commonly used mydriatics and miotics do not seem to affect the corneal dehydrases. The inhibitory effect of copper salts was found to be counteracted by sodium thiosulfate. Antihistamins and especially zinc are protection against the action of snake and bee poison. Therapeutically, zinc should be administered as soon as possible. When two or more hours have passed after the poisoning, zinc will be of little help. The inhibitory function exercised by zinc and other substances seems to some extent to be ascribable to the protection of the ocular dehydrases.

DIAGNOSTIC METHODS OF EXAMINATION, BIOMICROSCOPY, AND PHOTOGRAPHY

74. *Vital Staining of Conjunctiva and Cornea.* LT. COL. JACK W. PASSMORE AND COL. J. H. KING, JR., (MC) U. S. Army. Arch. Ophth. *53*:568, April 1955.

Various dyes which have been utilized most frequently in ophthalmology for staining the conjunctiva and cornea are discussed. The literature is reviewed and an attempt at evaluation has been made.

Three staining solutions would serve most ophthalmologists sufficiently well. Fluorescein is still the most satisfactory stain for general use if strict sterility is maintained. Preliminary evidence indicates that the utilization of polymyxin B sulfate in this staining solution offers additional protection against contamination by *Pseudomonas aeruginosa.* Bengal rose is more valuable in diagnosing early cases of keratoconjunctivitis sicca. Methylene blue is adequate for vital staining of subepithelial tissues, and its effect is enhanced by prior use of cocaine with a counterstain of fluorescein or scarlet red for contrast.

OCULAR MOVEMENTS AND MOTOR ANOMALIES NYSTAGMUS READING DISABILITY

75. *Strabismus Should Not Be Neglected.* A. L. MORGAN. Canad. J. Pub. Health. *46*:59–60, February 1955.

Cross-eyes can be corrected at any age but the best results are obtained before school age is reached. The chances of developing good binocular vision are better if treatment is started early. A cross-eyed child may develop a psychologic complex and for this reason alone treatment should be started early.

Glasses can be started at 1 year of age, an operation can be performed at any age. If treatment is not started until the child is 4 or 5 years of age, good results are difficult to obtain. Orthoptic training may be necessary and may be undertaken in conjunction with surgery.

76. *A Current Approach to Strabismus.* EDME. REGNIER. Postgrad. Med. *15*:463, May 1954.

Strabismus is best treated during the first six years of life. The goal consists of improving the vision of the crossed eye, aligning the eyes by removing the accommodative factor by surgery, and establishing binocular vision with depth perception by the use of orthoptics.

Surgery for strabismus which today is usually limited to a single eye too often reduces mobility of the eye and disregards the fact that strabismus is a defect in the cooperative function of both eyes. Single eye surgery is one of the many reasons for the almost universal failure to promote a true functional cure of strabismus.

ANOMALIES OF REFRACTION AND ACCOMMODATIONS; CONTACT LENSES

77. *The Ciliary Body in Accommodation and Accommodative Convergence.* M. W. MORGAN. Am. J. Optometry. *31*:219, May 1954.

Haploscopic studies of the accommodation and convergence of normal and presbyopic individuals indicate that no more effort is required for the last diopter of accommodation than the first, whatever the range available. The evidence supports the contention that there is no decrease in the responsiveness of the ciliary muscle with age. The lens becomes sclerotic and the pupil becomes smaller. In presbyopia, efforts to accommodate are not persistently increased because there is no change in the corresponding convergence.

78. *Testing the Visual Acuity of School Children.* J. R. GABY. Canad. J. Pub. Health. *46*:57–58, Feb. 1955.

The examination should be carried out in a moderately darkened room, preferably at 20 feet. Each child should be tested when he is alone. The chart should be placed at eye level. Children from kindergarten and Grade 1 should be tested with the illiterate "E" chart. The Snellen number chart may be used for Grade 1 and the Snellen letter chart may be used for Grades 2 to 13.

Faulty reading habits despite normal visual acuity may be indications of latent eye defects. 1 reference.

79. *Refractive Errors in Children.* T. J. PASHBY. Canad. J. Pub. Health. *46*:61–63, Feb. 1955.

Most babies are far-sighted. The refractions of the eyes change from year to year. Short-sightedness tends to appear between 8 and 12 years of age. The child develops introverted tendencies, accepts his near-sightedness and spends his time reading. When proper glasses are ordered, the child moves back into society. These children should be re-checked every six to twelve months.

Usually babies and pre-school children are refracted because the parents have

noticed some difficulty, such as a crossed eye, or because another member of the family has eye trouble. Proper glasses may be started at 12 to 14 months.

Preschool children are tested using atropine, school age children are tested with the aid of homatropine. The glasses ordered for children are surface hardened and are not likely to break or injure the eyes. Contact glasses are not recommended for children.

CONJUNCTIVA

80. *Ophthalmia Neonatorum.* H. L. ORMSBY. Canad. M. A. J. *72*:576, April 15, 1955.

Conjunctival infections and chemical reactions in 8,418 newborn infants were noted. The first 1,703 children were treated prophylactically with two drops of Sulmefrin (a solution of .5 per cent sodium sulfathiazole and 0.5 per cent sulfadiazine) in each eye immediately after birth. The next 1,570 children received 10 per cent sodium sulfacetamide to the conjunctival sac prophylactically. The next 3,127 children received 1 per cent silver nitrate to the conjunctival sac and the final 2,020 children had no treatment.

One per cent silver nitrate solution caused chemical reaction in the conjunctival sac of a small percentage of the children; however, the instance of staphylococcal, gonococcal, and inclusion conjunctivitis was low when this form of prophylaxis was used. When no prophylaxis was used there was a slight increase in the instance of gonococcal conjunctivitis. The instance of inclusion conjunctivitis was very similar to that which occurred when 1 per cent silver nitrate was used.

The chemical reactions from 1 per cent silver nitrate were not serious; the instance of gonococcal and inclusion conjunctivitis was low when this form of prophylaxis was used. One per cent silver nitrate has passed the test of time, has no harmful effects, and may be considered an efficient prophylactic for gonococcal ophthalmia.

CORNEA, SCLERA, AND TENON'S CAPSULE

81. *Preservation of Cornea by Dehydration.* LT. COL. JOEL N. MC NAIR AND COL. J. H. KING, JR., (MC) U. S. Army. Arch. Ophth. *53*:514, April 1954.

A successful method to preserve corneas for transplantation by dehydration is reported. Corneas completely dehydrated in glycerin can be stored for an indefinite period of time and will yield clear, nonperforating lamellar grafts.

82. *Nutritional Dystrophy of the Corneal Epithelium.* PABLO F. NAÑAGAS. Arch. Ophth. *51*:456, April 1954.

This is a sequel to an article published in 1953 which described the typical corneal changes of "nutritional dystrophy." Biochemical examinations of the blood and urine were made to determine vitamin levels. The low intake, storage

of vitamin B complex, and the therapeutic response to the administration of vitamin B complex is proof of the author's original conception that the disease is a nutritional one.

ANTERIOR CHAMBER AND PUPIL

83. *Editorial. The Argyll Robertson Pupil.* Canad. M. A. J. *72*:534–535, April 1, 1955.

Points suggesting that the Argyll Robertson pupil is caused by a lesion at the iris are reviewed. 4 references.

84. *The Pupil in Vegetative Dystonia.* H. OPPERMAN. Klin Monatsbl. f. Augenh. *124*:434, 1954.

The size of the pupil was measured by a still photograph using a white light directed toward the patient for 1/25 of a second or toward a white screen for 10 seconds. Eight patients with some disturbances of the autonomic nervous system showed variations of the size of the pupil when measured every morning. There was no correlation with the pulse frequency. Of 70 normal patients, 36 showed a dilation of the pupil with inspiration. In the other patients the pupil did not change, and only in one of the patients did the pupil become constricted during inspiration.

UVEAL TRACT AND SYMPATHETIC OPHTHALMITIS

85. *Diathermy Treatment of Uveal Melanomas.* G. JANCKE. Klin. Monatsbl. f. Augenh. *124*:681–685, 1954.

A small tumor above the macula in a 16 year old girl was treated with diathermy. Nevertheless, the tumor continued to grow and the eye had to be enucleated. Another patient, a 20 year old man, had a retinal detachment with a suspected tumor. Diathermy brought a permanent cure.

This type of treatment may be unsatisfactory in young patients. It should be tried only if a tumor arises in the only eye.

CRYSTALLINE LENS

86. *New Method for Fractionation of Lens Proteins.* J. FRANÇOIS, M. RABAEY, AND R. J. WIEME. Arch. Ophth. *53*:481–486, April 1955.

A new method of fractionation inspired by the work of Cohn and his school permits obtaining simple protein fractions from the aqueous extract of ox lenses. Since a very clear difference exists between the cortex and the nucleus a_C, a_C and Bc crystallin can be distinguished for the cortex and a_N and Bn crystallin for the nucleus. Although the a crystallins are electrophoretically homogeneous, the B

crystallins are, on the contrary, resolved by paper electrophoresis into two peaks.

Physical study reveals the existence of very large protein molecules, especially in the nucleus, which possess an evident tendency to agglomeration. The degree of agglomeration appears to be of great importance in the aging of the lens and formation of cataracts.

87. *Plastic Lens Insertion after Cataract Extraction. A Series of Cases and Modification of Technique.* J. P. HARSHMAN AND M. SHUSTERMAN. Canad. M. A. J. *72*:15–17, January 1955.

Three preplaced sutures in the corneal incision were used. After extracapsular extraction the plastic lens was partially inserted through the pupil. The sutures were then tied and the lens was manipulated through the pupil by means of a spatula applied against the cornea. Insertion of the lens was successful in 12 of 13 cases. In one patient the lens dislocated postoperatively and was removed. In seven eyes the final visual acuity was 20/30 or better. 8 references. 1 table.

RETINA

88. *Retrolental Fibroplasia.* O. D. PINKERTON. Hawaii M. J. *14*:31–314, Mar.-Apr. 1955.

Retrolental fibroplasia is manifest by edema, vascular proliferation, hemorrhages, and retinal separation occurring in premature infants, usually in those under 4 pounds, resulting in partial or total blindness. In an extensive survey, Owens and Owens of Johns Hopkins state that it occurs in 22 per cent of the infants under 1,360 Gm. (3 pounds). It is rare in infants over 2,000 Gm. (4.4 pounds).

Oxygen produces vascular obliteration in certain experimental animals when it is used in high concentration. Oxygen should not be routinely used for premature infants for it is believed that an actual sensitization or acclimatization occurs. When oxygen is withdrawn retinal anoxia is produced, with production of the pathologic process of retrolental fibroplasia. Oxygen sampling of the incubator air near the infant's head using the oximeter method and percentage estimation rather than depending upon liters per minute of oxygen flow would be desirable. Oxygen should never be given to a premature infant unless it is specifically indicated, and then only in amounts just adequate to maintain proper color.

Fundus study of all prematures weighing less than 4 pounds one week after birth is highly recommended. Should a premature require supplemental oxygen for more than seven days, very slow reduction of oxygen over a period of at least one week is recommended. A child with severe hypoxia at birth should have a fundus examination immediately before, during, and after oxygen therapy. A child suffering from severe hypoxia at birth should never have a transfusion until fundus examination has ruled out the presence of active or incipient retrolental fibroplasia because overloading the vascular system might cause an increase in the retinal pathology. A baby, particularly one who has had hypoxia and who has required the repeated use of oxygen, has probably been sensitized to oxygen and should be watched carefully for signs of retrolental fibroplasia.

89. *Direct Observation of the Effect of Oxygen on Developing Vessels. Preliminary Report.* N. ASHTON, AND C. COOK. Brit. J. Ophth. *38*: July 1954.

In previous papers Ashton and others reported that high concentrations of oxygen are able to exert a peculiar type of constrictor action on growing retinal vessels, which progresses gradually to complete obliteration of the ingrowing complexes. This paper is a preliminary report of experiments designed to shed further light on the mechanism of the process.

A new limbal window technique is described and an account is given of the direct observation of the effect of oxygen on the retinal vessels by this method.

It was found that oxygen has no observable effect on the retinal vessels of the adult cat. In the kitten, however, both immediate and delayed effects were seen. The immediate effect consists of vasoconstriction and capillary obliteration developing after five minutes exposure to oxygen. This does not progress to total obliteration and the vessels re-open after about 10 minutes, remaining in this state for about five and a half hours when the delayed reaction occurs. The vessels then constrict again and total vaso-obliteration gradually develops. In about eight hours the obliteration is complete. Once this has been achieved the circulation may be either opened or closed, in about five minutes in each case, by alternating air and oxygen. Vaso-obliteration cannot be induced in the detached retina, and obliterated vessels re-open when detachment develops.

90. *Constitutional Thrombophilia and Thrombosis of the Retinal Veins.* F. GASPARRI. Boll. d'ocul. *33*:347–355, June 1954.

Fifty patients, most of them older than 50 years, with retinal thrombosis, were studied as to personal and family history, general blood pressure, blood sugar, blood nitrogen, and prothrombin levels. The latter was above normal in the majority of the patients and so was the arterial blood pressure.

91. *The Development of the Surgical Treatment for Retinal Detachment at the Second University Eye Clinic in Vienna.* R. G. FREY. Klin. Monatsbl. f. Augenh. *125*:329–336, 1954.

From 1951 to 1953, 195 eyes were operated on. In 126 eyes (64 per cent), the detachment was cured. In aphakic eyes good results were obtained in 17 of 42 eyes. The combination of scleral resection and diathermy has become more popular during the last two years.

92. *The Origin and Relationship Between Anterior Dialysis, Retinal Cysts, Retinal Folds and Retrolental Fibroplasia.* H. WEVE. Tr. Ophth. Soc. Australia. *13*:35, 1953.

An attempt is made to show the relationship between anterior dialysis and retinal cysts, between retinal folds and retrolental fibroplasia, and finally, the relationship between these two groups. The thesis is suggested that all the above conditions may be grouped together as degenerative processes and secondary

organizations caused by abnormal oxygenation and nutrition in early youth, especially in those parts of the retina, which are the latest to become vascularized.

It is also noted that other forms of eye disease may eventually be included in the same group. Among these might be special forms of detachment observed in the young which are not localized at the ora serrata but between it and the equator and in which small holes are found in a degenerated area.

93. *Effect of Oxygen Weaning in Retrolental Fibroplasia.* ROBERT H. BEDROSSIAN, PAUL CARMICHAEL, AND JOSEPH A. RITTER. Arch. Ophth. *53*:514, April 1955.

A group of premature infants who were suddenly removed from an atmosphere of 50 per cent oxygen had a significantly higher incidence of retinopathy of prematurity than did another group of premature infants who had a gradual reduction in the concentration of their oxygen environment. Infants with progressive retinopathy were given oxygen therapy with a definite beneficial effect.

The vasodilation and neovascularization associated with a retinal hemorrhage near the end of a developing retinal blood vessel are also described. Three possible mechanisms by which the disease may develop are suggested.

Although retinopathy of prematurity is primarily an anoxic disease, the direct effect of oxygen is an important factor in its development. The administration of supplemental oxygen to premature infants should be limited to the minimum amounts necessary. A 40 per cent concentration inside the incubator is probably the level which should not be exceeded as a routine measure.

Improper withdrawal of supplemental oxygen is the commonest precipitating factor in the disease. Therefore, a gradual reduction of the oxygen concentration should be made before oxygen is completely stopped.

Oxygen therapy is of value after retinopathy develops if judiciously used and gradually withdrawn.

NEURO-OPHTHALMOLOGY, OPTIC NERVE, VISUAL PATHWAYS, CENTERS, AND VISUAL FIELDS

94. *Notching of the Optic Chiasm by Overlying Arteries in Pituitary Tumors.* C. W. BUCKER AND J. W. KERNOHAN. Arch. Ophth. *51*:161, Feb. 1954.

Five cases with clinical and necropsy findings are reported to demonstrate that pituitary tumors may press the optic nerves and chiasm upwards against arteries of the Circle of Willis. The pressure results in notching of the nerves which is anatomically consistent with inferior temporal field defects occurring late in the disease.

The early upper bitemporal defects are probably the result of direct pressure of the tumor against the anterior margin of the chiasm, interfering with its blood supply. As the tumor forces the chiasm upwards and forward the anterior cerebral arteries are put on the stretch. The constant arterial pulse transmitted from the internal carotid to the tightly drawn anterior cerebrals produces notching of the chiasm or optic nerves. Anatomic sketches, photographs, photomicrographs, and

visual fields are correlated to illustrate the clinical and pathologic relationship. The pre-existing literature from 1852 is reviewed.

95. *Amaurotic Familial Idiocy (Tay-Sachs Disease) in Non-Hebrew Siblings.* I. M. GOURLEY AND F. W. WIGLESWORTH. Canad. M. A. J. *72*:521–524, April 1, 1955.

Two cases are described in successive male siblings of mixed Irish and French-Canadian descent. The fundi showed pallor and atrophy of the disc and a cherry-red spot at the macula. On pathologic examination, the abnormal substance in the central nervous system showed a strongly positive periodic acid Schiff reaction. 1 reference. 4 figures.

96. *Ocular Signs of Wernicke's Disease.* D. G. COGAN AND M. VICTOR. Arch. Ophth. *51*:204, Feb. 1954.

Wernicke's disease is thought to be due to thiamine deficiency. It is seen primarily in alcoholics and consists of mental confusion of the Korsakoff type, ataxia, and peripheral neuropathy. The principal ocular signs are nystagmus, external rectus palsy, and paralysis of conjugate gaze. The disease may appear as early as six weeks in severe nutritional deficiencies. It improves rapidly with thiamine administration although nystagmus may persist for years. The authors report 5 cases.

GLAUCOMA AND HYPOTONY

97. *Inflammatory Glaucoma after Psychic Insults.* F. DIENER. Klin. Monatsbl. f. Augenh. *124*:393, 1954.

Eight cases of "emotional" glaucoma are described. These were instances of narrow angle glaucoma which the author calls "inflammatory." Some of these occurred soon after an operation on the other eye. It is not stated whether both eyes were bandaged, in that way producing a prolonged dark room test. It is noteworthy, however, that the many air attacks during the war produced only 2 cases of acute glaucoma in the area of Münster.

ALLERGY

98. *Allergy as a Cause of Glaucoma.* R. D. WISEMAN AND D. E. MOORE. J. Allergy. *25*:355, July 1954.

The role of allergy as a possible cause of glaucoma is discussed, and a case of simple, recurrent, congestive glaucoma apparently due to allergy is presented.

Over a period of seven years the patient had had recurrent pain in and around the left eye, usually coming on about two hours after meals, but his vision was not affected. During these attacks the eye would tear and become red. The patient

also complained of being bloated with gas before the eye symptoms developed. After keeping a food diary to check food sensitivity, it was discovered that his trouble came after eating peaches, mayonnaise, and green peas. The patient was put on an elimination diet which included the avoidance of these foods as well as beans, nuts, mustard, oranges, and pitted fruits. The patient felt better almost immediately and continued feeling better until he drank orange juice and tried eating peas after which he became most uncomfortable. On each occasion the symptoms subsided as soon as he went back to his elimination diet.

In view of this, the authors feel that either oranges or any member of the legume family could produce a flare-up of his glaucoma and gastrointestinal distress.

99. *Corneal Changes after Ingestion of Sulfathiazole.* IGNACY ABRAMOWICZ. Klinika Oczna. *23*:255, 1953.

A woman, 40 years of age, took two tablets of sulfathiazole. There was an allergic reaction in the form of itching hands and feet, nausea, headache, and pain in the eyes. Both eyes were congested and sensitive to light. On slit lamp examination, fine brownish granules were found just under Bowman's membrane. The visual acuity was not affected. Four months later she had sulfathiazole eye drops with similar ocular symptoms. The author discusses the literature on the subject of the ocular reaction to sulfa drugs.

ANESTHESIA

100. *Modern Anesthesia in Ocular Surgery of Children.* BRUNO HAID. Klin. Monatsbl. f. Augenh. *124*:277, 1954.

Various methods for anesthetizing children are reviewed with special emphasis on endotracheal anesthesia. The author cites his experiences with 93 children under the age of 12 who underwent eye surgery with general anesthesia.

MEDICAL OPHTHALMOLOGY

101. *Ocular Symptoms in Diabetics.* E. MIRATYNSKA-RUSINOWA AND H. LISIECKA-ADAMSKA. Klinika Oczna. *24*:75, 1954.

The authors summarize the results of the examination of 667 diabetic patients. Disease of the iris was seen in 4. In 129 patients (19 per cent) diabetic retinitis was found. There were aneurisms in 195 (27 per cent) and arteriosclerotic changes in 205 patients (30 per cent). Four cases of optic neuritis could be attributed to diabetes.

102. *Ocular Manifestations of Infectious Mononucleosis.* O. R. TANNER. Arch. Ophth. *51*:229, Feb. 1954.

The ocular manifestations of infectious mononucleosis are frequently not recog-

nized. They may be divided into two groups; those due to lesions of the eye itself, and those due to lesions of the central nervous system. The first group may include conjunctivitis, lid and periorbital edema, episcleritis, optic neuritis, papilledema, and retinal hemorrhages. The second group includes palsies of the extraocular muscles, ptosis, nystagmus, disturbances of conjugate deviation, hemianopsia, and scotomata. The literature is reviewed and a case is presented.

103. *Congenital Alacrima in Familial Autonomic Dysfunction.* JOHN H. DUNNINGTON. A. M. A. Arch. Ophth. *52*:925, December 1954.

Congenital alacrima and corneal hypesthesia are constant ocular findings in familial autonomic dysfunction according to Dunnington. The disease is characterized by drooling, blotching of the skin, intermittent hypertension, and emotional instability. The management of the indolent corneal ulcers, which occur in approximately one third of these cases, is discussed and 3 illustrative cases are reported.

104. *Temporal Arteritis Syndrome with Ocular Involvement.* FREDERICK C. CORDES, San Francisco, Calif. Am. J. Ophth. *38*:495–500, October 1954.

The literature on temporal arteritis syndrome with special reference to ocular complications is reviewed, and 2 cases are reported in which there was involvement of the ophthalmic artery.

The first of the 2 cases was an example of the type in which there is an occlusion of the central retinal artery with arteritis. In the second case, there was an ischemic type of optic neuritis. Both patients developed the ocular signs and symptoms after all evidence of temporal arteritis had subsided—three months later in the first case, and five weeks after temporal arteritis in the second case.

Since the arterial disease is not limited to the temporal and ophthalmic arteries as originally thought, but is found scattered throughout the vessels of the body, the author feels the term "temporal arteritis syndrome" does not properly describe it, but can serve the purpose until further knowledge of the disease suggests a better name. 21 references. 1 figure.—*Author's abstract.*

105. *Ocular Trichinosis.* KRYSTYNA KLEMANSKA. Klinika Oczna. *24*:37, 1954.

A woman, 30 years of age, was seen with edema of both lids of the left eye, myalgia, and double vision. Examination was essentially negative; only the skin test for trichinosis was positive. Within two weeks all the symptoms disappeared.

106. *Hypertensive Retinopathy.* W. HERBST. Klin. Monatsbl. f. Augenh. *124*:446, 1954.

This is a study of 40 patients with essential hypertension who were treated with Hydergin. Hydergin, an ergot preparation, was administered in drop form. The starting dosage was 5 to 10 drops three times daily; this was increased later. An improvement was noted in about two thirds of the 40 patients.

107. *Ophthalmological Complications of Multiple Myelomatosis.* EDWIN CLARKE, London. Brit. J. Ophth. *39*:233, April 1955.

Owing to improved methods of diagnosis, incidence of multiple myelomatosis has increased markedly in the last 10 years. Its manifestations are widespread, but those involving visual apparatus have received little attention, according to the author. He therefore reviewed the ophthalmologic complications of this disease and found that the retina, choroid, optic disc, ocular nerves, orbit, optic nerve, or central visual connections may be affected. Examples of each are cited and a case of diplopia due to sixth nerve palsy is described.

108. *The Oculoglandular Form of Tularemia.* KONRAD ZEMBRZUSKI. Klinika Oczna. *24*:29, 1954.

Until 1950, 47 cases of tularemia were described in Poland, of which 5 were oculoglandular. The author discusses epidemiology, pathogenesis, and symptoms of the oculoglandular form of tularemia, and describes an example in a 30 year old woman.

PHARMACOLOGY, TOXICOLOGY, AND THERAPEUTICS

109. *Cataract Formation Following Beta-Ray Radium Therapy.* GEORGE M. HAIK, WOOD LYDA, RICKEY L. WAUGH, JR., AND GEORGE ELLIS, New Orleans, La. Am. J. Ophth. *38*:465–470, October 1954.

One of the outstanding advances in ophthalmology over the past several years has been the development of beta-ray radium therapy. It has proved useful in a variety of conditions, including papillomas, corneal vascularization, and corneal scarring, as well as in the preoperative and postoperative management of keratoplasty. Until quite recently it was believed that if it were used with the proper precautions, it was an innocuous method and cataract formation would not follow its use. The observation of five instances of cataract in 4 patients has shown that this generalization was not correct.

All of these patients were treated for recurrent pterygia. The total dosages, which were delivered by the Iliff applicator, varied from 19 to 40 minutes. The applications were made during the period 1947 to 1949 and the technique employed was that originally advised by Iliff. Follow-up observations in 2 of the 4 patients showed practically no change in the eyes for 15 and 18 months, respectively, after the cataracts were first observed.

The technique now employed in the management of pterygia is as follows: A single application, which does not exceed five minutes in any area, is made routinely immediately after surgery, when new vessels are most responsive to radiation. The application is not repeated unless there is a recurrence (pseudopterygium). A secondary operation is then performed, followed immediately by a five minute application with the Iliff applicator.

It is important that other observers record their experiences with cataract

formation and other complications following beta radiation. Pooling of experiences will help to eliminate any hazards which may be connected with the use of this extremely valuable ophthalmologic technique. 4 references. 3 tables.—*Author's abstract.*

110. *The Treatment of Interstitial Keratitis.* D. P. NORTH. Brit. M. J. No. 4878, p. 7, July 3, 1954.

Since the use of cortisone was begun, 20 cases of interstitial keratitis associated with congenital syphilis have been treated at St. Mary's Hospital, London, and closely observed for one year. Some of these patients had had attacks of keratitis prior to the use of cortisone and already suffered visual impairment, while in several other cases keratitis was already well advanced before such treatment. Eight of the 20 cases had had no previous attacks or any visual impairment prior to the illness for which they were being treated. These 8 cases are reported.

Of the 8, 3 had had full syphilitic treatment for at least a year, including not less than 9,000,000 units of penicillin, before interstitial keratitis appeared. The other 5 started cortisone and antisyphilitic treatment at the same time.

In every case the results obtained were excellent. What would formerly have been a long and painful illness with resultant blindness or defective vision was transformed by the use of cortisone into an acute condition lasting only a few days, and easily kept under control until the eyes were quiet and vision restored. The patients were hospitalized only during the acute stage, which seldom lasted more than a week. As soon as the condition could be controlled with local instillations they were treated as outpatients. Five of the 8 cases later experienced recurrence of symptoms, but these were rapidly controlled by cortisone drops. There was no impairment of vision in any of the cases discussed. The point is made that sight need not be impaired in any case of syphilitic keratitis if treatment with cortisone can be started before corneal infiltration obscures the vision.

111. *Pyocyaneus Ulcer. Clinical Report and Experimental Investigation.* R. K. WILLIAMS, M. E. HENCH, AND D. GUERRY, III. Am. J. Ophth. *37*:538, April 1954.

Pseudomonas aeruginosa (Bacillus pyocyaneus) causes a severe, rapidly spreading, dead-white corneal ulcer, usually one to three days after a minor abrasion of the cornea. Penicillin, the sulfonamides, and streptomycin have been tried in treating the condition, and although the eyes were saved, the visual results were not very good. Better results have been obtained experimentally with the polymyxins.

A case of pyocyaneus ulcer was treated by large doses of streptomycin subconjunctivally, intramuscularly, and topically, and aureomycin, orally. Vision of 20/20- 1 was retained. When the highly virulent organism obtained from this patient was cultured, it was found that polymyxin B was more effective in controlling its growth than polymyxin E or dihydrostreptomycin.

After an 18 hour incubation period, ulcers of the corneas of rabbits infected with pyocyaneus were treated with polymyxin B or E in daily doses of 25,000 units given subconjunctivally. Response to both polymyxins was equally good

when treatment was started early; healing took place with only faint scarring. It is suggested that 50,000 units of polymyxin B by conjunctival injections daily, and hourly instillation of polymyxin solution may be used in treating pyocyaneus ulcers of human corneals.

112. *Cortisone in the Treatment of the Oculo-mucous Membrane. (Stevens-Johnson) Syndrome.* B. SHALLARD AND J. M. LAYNG. Canad. M. A. J. *71*:38–40, July 1954.

The case of a 73 year old woman who developed erosions of the mucosa of the mouth and pharynx, involvement of the upper and lower respiratory tract, severe blepharitis and conjunctivitis, inflammation of the submaxillary salivary glands, and fever is presented. The disease did not respond to antibiotics, but did respond to intramuscular cortisone therapy.

The etiology of the Stevens-Johnson syndrome is unknown. It may persist for months and relapses are common. Aureomycin may or may not be helpful but, recently, ACTH and cortisone have been found to be of great value. 19 references. 2 tables.

113. *The Treatment of Retinal Vascular Diseases with Extracts of he Wild Chestnut.* M. CREMER. Klin Monatsbl. f. Augenh. *125*:94–99, 1954.

For five years these extracts were used on patients with venous disorders of the fundus. The drug is given orally. The results were encouraging. 15 references.

114. *Treatment of Retinoblastoma by Radiation and Triethylenemelamine.* ALGERNON B. REESE, GEORGE A. HYMAN, GEORGE R. MERRIAM, JR., ARNOLD W. FORREST, AND MORTON M. KLIGERMAN. Arch. Ophth. *53*:504, April 1955.

As a result of 21 months' experience treating retinoblastoma with a combination of radiation and triethylenemelamine, the authors feel that these two agents implement each other in such a synergetic manner that they offer the best method to date for treating this type of tumor.

115. *Corticotropin, Cortisone, Thyroid, Testosterone in Syphilitic Interstitial Keratitis.* J. V. KLAUDER AND G. P. MEYER. Arch. Ophth. *51*:432, April 1954.

Fifty-six eyes with acute luetic interstitial keratitis were treated with one of the drugs listed in the title or a combination of some of them. Conjunctival injection of cortisone was of doubtful benefit and so was parenterally administered corticotropin. Topical application of cortisone resulted in a dramatic improvement in mild and moderate cases but there was a tendency towards recurrence. In severe cases, topical cortisone was ineffective. The authors have discontinued the use of cortisone because of the high incidence of recurrence and because they feel that cortisone prevents the development of local immunity and cure.

Thyroid was administered concurrently with fever therapy and arsenicals, with beneficial results. Testosterone was administered prior to the use of fever and

arsenicals. The authors conclude that systemic treatment is essential. Fever and antisyphilitic drugs are more effective in producing favorable results if high doses of desiccated thyroid are used concurrently.

HYGIENE, PROPHYLAXIS, OCCUPATIONAL OPHTHALMOLOGY, AND INJURIES

116. *Hydrogen Sulfide Eye Inflammation-Treatment with Cortisone.* H. T. NYMAN. Indust. Med. & Surg. *23*:161, April 1954.

In the chemical industry, particularly the artificial fiber industry, both acute and chronic hydrogen sulfide and carbon disulfide poisoning occur. Acute conjunctivitis is the most common effect. Some patients develop keratitis after the conjunctivitis has persisted for a few days, but occasionally the two conditions occur simultaneously. The corneal epithelium is often ruptured and it is not unusual for the broken surface to cover practically the entire cornea. The patient at this stage is almost completely blind, in intense pain, and unable to open his eyes.

Treatment with zinc and atropine was found to be unsatisfactory. Scopolamine was effective in curing slight conjunctivitis in two or three days, and severe cases in one to two weeks. Slight keratitis was cured with this drug in one to one and a half weeks, severe cases in two to eight weeks.

Since the author attempted treatment with cortisone in December, 1951, he has used only cortisone acetate and physiologic saline solution in 237 patients. No case of conjunctivitis developed later into keratitis. The corneas of all keratitis patients have remained intact, and severe painful conditions have not developed at all. No patient has remained away from work for more than five days; the average time lost has been two days. Cortisone treatment of chemical eye injuries from sulfuric acid, lye, or viscose has been successful in 15 patients. The average loss of working time for such patients formerly averaged two to three weeks, while only one of the patients treated with cortisone lost more than three days.

117. *Prophylaxis of Ophthalmia Neonatorium.* IDA MANN, Perth, Western Australia. Brit. J. Ophth. *38*:734, December 1954.

The incidence, type, and course of ocular infections in the newborn were investigated in 1,148 live births at the King Edward Memorial Hospital, Perth, Western Australia, by Ida Mann.

The infants were divided into two groups. The controls received no prophyla tic treatment at birth other than cleaning the lids; the other group received 1 drop of 1 per cent silver nitrate.

Discharge from the eyes within the first 12 days occurred in 100 of the control group of 569 live births, and in 72 of 579 live births in the treated group. No severe case occurred in either group. Cases in the treated group cleared up quicker than in the control group.

In the treated group the discharge appeared early; it was largely due to reaction to the silver nitrate and was sterile. Streptomycin sensitivity was positive in all the organisms tested. It is demonstrated that the old teaching about silver nitrate is correct, but it is suggested that its use is unnecessary in a modern hospital and in a population in which gonorrhea is rare.

118. *Injuries of the Eye.* W. P. CALLAHAN. Bull. of the Hosp. for Sick Children, Toronto. *3*: (6) 83–85, November 1954; *4*: (1) 10-12, January 1955.

The various types of injuries which may damage the eye are reviewed under the headings of mechanical agents, chemical burns, and types of radiation.

119. *Prophylaxis with Penicillin in Perforating Injuries.* K. V. VOM HOFE AND W. WÜSTENBERG. Klin. Monatsbl. f. Augenh. *124*:534, 1954.

In a series of 200 cases of a perforating injury, each second patient was given one subconjunctival injection of penicillin followed by repeated administration of a penicillin ointment. The other patients remained untreated. In the treated cases nine purulent infections occurred and five of these eyes had to be enucleated. In the control series there were 14 infections and eight eyes had to be enucleated.

120. *Eye Injuries in Children.* J. S. CRAWFORD. Canad. J. of Pub. Health. *46*:64–66, Feb. 1955.

This is a general article surveying all ocular injuries in children. It is divided into four parts: (1) contusions, (2) extra-ocular and intra-ocular foreign bodies, (3) lacerations of the lids and globe, and (4) burns and injuries by caustics.

Accidents of various kinds cause 50 per cent of all blindness in one eye and 20 per cent of all blindness in both eyes. Hyphema is frequently seen in children. Children with this condition should be put to bed and kept quiet. If the hemorrhage has been massive there may be a resultant glaucoma, and it may be necessary to evacuate blood by an operation.

Eyes injured by BB guns are frequently seen. If the pellet has traveled a long distance or struck the eye from an oblique angle, it may cause little damage. If the eye is hit from a shorter distance, the globe is penetrated or the pellet may lodge in the orbit outside the globe.

Repair of lacerations to the lids should be done within the first few days after injury. Lacerations of the eyeball need immediate treatment. Prophylactic treatment attempts to prevent further injury to the eyes, immobilization to prevent herniation of ocular contents, chemo-therapeutic agents and antibiotics to prevent infections and tetanus toxoid. Prognosis must be guarded. The threat of sympathetic ophthalmia is always a concern. Sympathetic ophthalmia rarely occurs before two weeks after injury.

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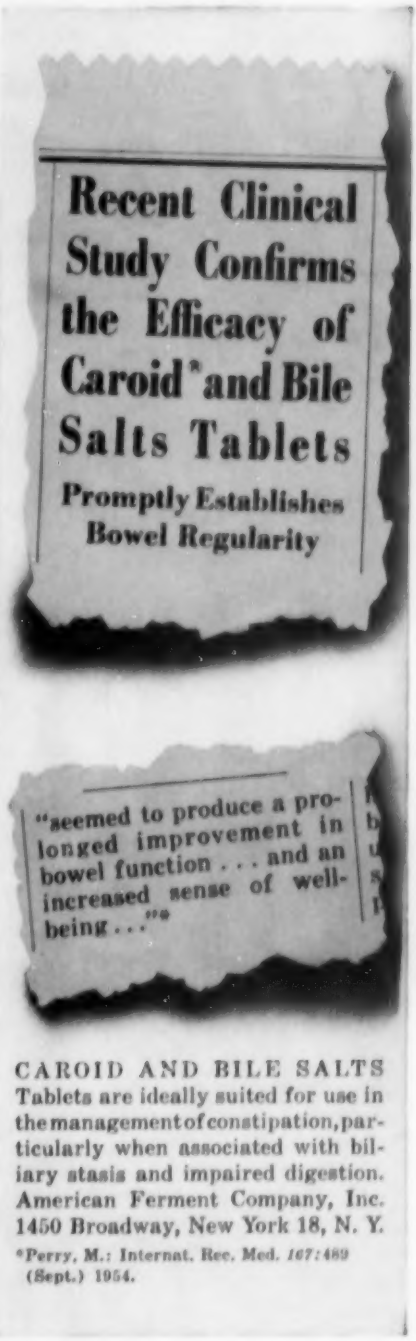
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*Perry, M.: Internat. Rec. Med. 167:469 (Sept.) 1954.

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1. Domas, K. J.; Carlozzi, M., and Wright, W. A.: Antibiotic Med. *1*:296 (May) 1955. 2. Prigot, A.: Ann. New York Acad. Sc., in press. 3. Milberg, M. B., and Michael, M., Jr.: Ibid. 4. Pollack, H., and Halpern, S. L.: Therapeutic Nutrition, Prepared in Collaboration with the Committee on Therapeutic Nutrition, Food and Nutrition Board, National Research Council, Washington, D. C., 1952.

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